MEASURING THE STAGES OF CONCERN IN THE DEVELOPMENT OF COMPUTING EXPERTISE

By

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A DISSERTATION PRESENTED TO THE
GRADUATE SCHOOL OF THE UNIVERSITY OF FLORIDA
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1989

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ACKNOWLEDGMENTS

The completion of a project such as this would be impossible without the assistance of many individuals. I would like each of them to know how much I appreciate the help that was provided me. I was especially fortunate to have Dr. James Heald as my committee chairman. He was always available with sound advice and abundant technical knowledge. The confidence that Dr. James Hensel expressed in the project was gratifying. Dr. Lee Mullally asked questions that required me to become more aware of my audience and thus to write with greater clarity.

I would also like to express my gratitude to Dr. Gene Hall, who generously shared his expertise and resources with me. His enthusiasm and encouragement were deeply appreciated. I also owe a great deal to Dr. Archie George for sharing with me his wealth of statistical knowledge, good humor, and encouragement. The excellent work of Sara Kolb and Jerry Barucky provided the models for my work, and I am very grateful to them.

Much of the work involved in this dissertation centered on my ability to gain access to the subjects. My deepest

appreciation is extended to all of those who said "yes." Thanks also go to all of my colleagues and friends who listened to me, shared their ideas with me, and made me laugh when I did not feel like doing so. Of course, special thanks go to all of the participants in this study. In addition, Leila Cantara, Kathy Carroll, and Evelyn Sparrow were especially helpful to me in the completion of my doctoral program.

Finally, my greatest thanks I have saved for my dearest colleague, my best friend, my husband Ken. He provided unwavering patience and encouragement, never complaining that I almost always had work to do.

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Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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May, 1989

Chairman: James E. Heald
Major Department: Educational Leadership

A three-phase study was undertaken to determine if the Stages of Concern, a change theory model formulated in earlier studies of teacher education and educational innovation adoption, could be applied to the computing experience, and to determine whether a valid and reliable instrument for assessing Stages of Concern among computer users could be developed within this framework. Additional questions were formulated to determine whether the intensities of the concern stages were dependent upon the amount of experience a person had with a specific computer application; to determine whether there was a sequential pattern to the Stages of Concern which was associated with computing experience or education; to determine if concerns about using computers were associated with age and/or gender of an individual; and to determine what effects a major

system or software change had on a computer user's concerns profile.

The identification of types of concerns held by a broad range of individuals about computing was accomplished in Phase I. An open-ended, statement-of-concern form was used to collect the concerns from 222 respondents. From the data, the researcher identified 156 usable statements, which were Q-sorted into categories. In Phase II, the statements receiving a high degree of agreement as to categorical fit were included in a 78-item questionnaire which was administered to 323 participants whose computing experience ranged from none at all to extensive. Responses from those subjects were factor analyzed to determine if factors associated with the hypothesized stages emerged. Based on the results from this preliminary questionnaire, a final, 32-item questionnaire was developed and administered in Phase III to a separate sample of 388 participants with a broad range of computing experience. Data from the responses again were analyzed with factor analysis.

The construct validity of the instrument was measured using factor analysis results and item/stage scores, item/total scores, and interstage correlational analyses. Reliability of the 32-item questionnaire was determined by Cronbach's alpha correlation and by using test-retest correlations. Other research questions were addressed by using analyses of variance to determine differences among mean stage score responses for each variable subgroup.

CHAPTER I
INTRODUCTION

Rationale for the Study

Although we are still very much in the grip of the "Second Wave," evidence of "Third Wave" changes envisioned by Toffler (1980) abound. One needs only to browse through any newspaper to find ample evidence of the decay that was prophesied--the breakdown of the nuclear family, the accelerated crime rate, and dangerous economic oscillations. Within this environment, a new society reliant upon an increased technological base is being formed. Powerful computing systems are changing the workplace as prophesied in Megatrends (Naisbitt, 1982). The tremendous growth and rapid evolution of computer capabilities during the past few years have created tremendous challenges for organizations and their managers. The future promises to bring with it accelerated technological transformation. The tumult, created by technological innovation, requires a substantial amount of "high touch" in order to successfully transcend this turbulent period of history (Naisbitt, 1982).

Students, educators, professionals, managers, and workers in almost every endeavor have been a part of or have

been affected by the computer revolution. The transformation from a nonuser of the technology to one who has developed whatever level of expertise is necessary or desirable is often accompanied by feelings that range from slight apprehension to almost paralyzing fear.

Attitudinal studies often have been focused on levels of anxiety, aversion, or apprehension associated with the use of computers. There is a growing body of knowledge to suggest that concerns about computing do influence performance (Meier, 1985; Nickell & Pinto, 1986), and there is strong evidence to suggest that women, as a group, do not feel as positive as men do about the technology. Further, a gender gap seems to have developed regarding the use of computers among children.

Girls are not taking advantage of opportunities to use computers available to them in school. This has been particularly conspicuous in middle and high school grades. Students who have an aversion to the technology are likely to become adults who are the most fearful and view the computer as a threat rather than a tool. This condition is of utmost importance because of the possibility of detrimental occupational consequences (Sanders, 1986). To compound the problem, additional researchers have supported the finding that there is a gender difference among college students (Nickell & Pinto, 1986; Sproull, Zubrow, & Kiesler, 1986), and other researchers have provided some preliminary evidence of the

impact of computer aversion as it is manifested at that educational level (Fritz, 1985; Meier, 1985; Wallace, 1986).

Newspaper columnist Lewis Grizzard (1987) provided a passionate plea for understanding of people, like himself, who suffer from high anxiety over the use of computers. One does not have to be a columnist and author in order to be expressive about his or her feelings regarding the use of computers. One novice student reported his first experience in the computer lab without his instructor:

> I was afraid of destroying the disk because it didn't look very sturdy and while I was typing, I was worried about power fluctuations. And I was worried about messing up somehow and making an irreversible error and having to start all over again. And helpless! Strained helpless! I felt really helpless. And the poor girl that worked in the lab, I was constantly needing her help . . . not out of necessity. I guess I could have figured it out on my own, but I was so afraid. I almost had to have her standing there while I did this whole letter because it was the first time on my own and I wanted her standing there just in case I did something wrong. (Martin, 1987, p. 10)

Certainly not everyone who comes into contact with the technology suffers from cyberphobia; however, observers have noted numerous variations of fearful reactions to the use of computers. For many people, male and female, young and old, the initial computing experience can be traumatic. Fortunately most people survive the experience, traumatizing though it may be.

In a pilot study, Martin (1987) observed that computer users developed different types of concerns as they learned

to use the computer, and these concerns seemed to follow a sequential pattern. Initial concerns about their own abilities to cope subsided, and other concerns surfaced to replace the apprehensive ones. These new concerns focused more on the task itself. More specifically, they centered on factors such as time required to complete the task, availability of help resources, and quality of the product produced. Further, the types of concerns expressed by more experienced computer users related to cooperative work with peers or how to adapt what they had learned to a different project. Finally, apprehension about one's own ability frequently resurfaced when he or she was confronted with a major procedural change in the use of hardware or software. However, self-concerns were neither so overwhelming nor did they take as long to subside when compared to the anxiety experienced by someone new to the use of computers.

Insights into the change process have been acquired by researchers over time. A number of different models have been developed to aid in understanding what takes place when change occurs (Havelock, 1971). Many of the behaviors and perceptions documented among computer users are similar to those identified as "concerns" in the teacher development process noted by Fuller (1969) in her work with student teachers. Subsequently, Fuller developed the Teacher Concerns Model, which categorized various types of concerns about teaching. These concerns are progressive and can be

grouped into three broad categories: self concerns, task concerns, and impact concerns. This work was elaborated upon and generalized to the process of the adoption of an innovation by Hall, Wallace, and Dossett (1973). Hall, George, and Rutherford (1979) described the adoption of an innovation as a process through which individuals migrate. The product of the endeavors of Hall et al. (1973) was the Concerns Based Adoption Model (CBAM) of which one diagnostic dimension recognizes seven distinct Stages of Concern (SoC) about an innovation that are experienced during the change process. Hall and others have demonstrated the diversity, validity, and reliability of the model through a body of research conducted both nationally and internationally (Hall & Hord, 1987; Van den Berg & Vandenberghe, 1981).

Additionally, research related to the Stages of Concern was extended to the nursing profession by Kolb in a 1983 study. Subsequently, Barucky (1984) added another dimension to the concerns theory knowledge base in his study by broadening the framework to encompass leadership development in the Air Force professional military education programs.

Recognizing the diverse application of the concerns model, there appears to be ample confirmation that the model can be used to provide the theoretical framework to examine the various concerns that are being observed among computer users. One practical application would be the development of appropriate interventions to mitigate the more harmful

effects of change that are related to the use of computers. At the theoretical level, the introduction of computing is an area of change that has not yet been used to test the generalizability of the Stages of Concern framework.

Problem Statement

A priority in this investigation is to determine if the Stages of Concern Model is an appropriate conceptual model to assess concerns among computer users. Subsidiary tasks closely related to this primary task are to determine if an instrument for assessing Stages of Concern among computer users can be developed within the framework; to determine if there is a relationship between the level of computing education and the sequence of concern stages; to determine if there is a relationship between the intensities of various concern stages and the computing application experience level of an individual; to determine the associations between age/gender and SoC scores; and to determine what effect a major system or software change has upon a computer user's concern stage and concern sequence.

Purposes of the Study

Technology can cause tremendous apprehension for some people. It can severely handicap the choices available to them as students, as evidenced through course selection, and later in career choices. There may be some groups of people, possibly women and older adults, who suffer disproportionately from this handicap. Even when the

experience is not excessively traumatic, concerns can inhibit the maximum benefits that could be obtained during the learning process. A first step in mitigating the debilitating consequences of this situation is to develop an instrument that can be used to identify the current concerns level of individuals using computers. Only after this is accomplished can relevant intercessions be used to expedite and ease the transition into the next stage of the process. More research must be conducted in order to develop a valid and reliable instrument to identify the variety of concerns that are common to computer users who have varying levels of expertise and experience with the technology. The findings of this research can then be used to answer the question about the feasibility of the Stages of Concern framework as a theoretical structure for the development of an instrument to identify the concerns of computer users and other related questions.

Therefore, the purposes of this study are several. The first purpose of this study is to corroborate and advance the knowledge base regarding the concepts of the Concerns Model by establishing a model that represents the concerns of computer users. Second, this study is intended to develop an instrument that can be used to determine the Stages of Concerns about computing that exist in a wide range of people using the technology. The instrument will be subjected to appropriate tests to determine its validity and

reliability. Third, this study is intended to determine if there is a relationship between the level of computing education and the sequence of concern stages. Fourth, this study is intended to determine if there is a relationship between the intensities of various concern stages and the computing application experience level of an individual. Fifth, this study is intended to determine the associations between age/gender and SoC scores. Finally, it is the intent of this researcher to determine what effect a major system or software change has upon a computer user's concern stage and concern sequence.

Significance of the Study

The primary importance of this study is the extension of concerns theory into yet another area of study. Extensive research that has already been undertaken has shown that the Stages of Concern model can be a powerful tool for undertaking and advancing the educational process. Without a doubt technology will continue to advance, and people must be aided in the adaptation process. Change carries with it major ramifications for the individual and society as the use of the innovation becomes more prevalent. The ramifications can take the form of a course of study not pursued, a career not sought, a position of advancement not achieved, or something more subtle such as unnecessary stress that may

manifest itself in negative ways. The individual might suffer a lessening of self-confidence or a feeling of lack of competence which can be so detrimental to the human condition. None of these consequences is very desirable. Certainly, additional research is necessary in order to better understand the process of adapting to changes in the computing environment. Only then can the maximum benefit be achieved from the advancements that are being made in computing technology. Only then can we develop the most effective and relevant interventions that will allow users of the technology to progress at an optimal pace.

Study Questions

1. Do identifiable "stages (factors) of concern" about the development of computing expertise exist among individuals with varying amounts of computing experience?

2. Can an instrument for assessing Stages of Concern among computer users be developed within the framework which is both reliable and valid?

3. What is the relationship of the level of computing education and experience to the sequence of concern stages?

4. What are the relationships between the intensities of various concern stages and the computing application experience levels of individuals?

5. What are the associations between age and gender with SoC scores?

6. What effect does a major system or software change have upon a computer user's concern stage and concern sequence?

Definition of Terms

In this study, the key terms will be defined as follows:

The definition of concern as used in this study was developed by Hall et al. (1979). The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task is called concern.

Stages of Concern are a set of sequential stages of concern through which a person facing change is believed to pass.

Peak Stage of Concern refers to percentile scores used to provide a comparison of relative intensity of concerns at each stage. Although an individual may communicate concerns that are exemplary of many different stages, the stage of predominant intensity is referred to as the Peak Stage of Concern.

Cyberphobia is an intense fear of computers or any of the associated devices.

Computer users will be categorized as follows:

A novice is a person who has some knowledge about computing but whose experience is very limited either by type of computing application or amount of actual time spent with a computer or associated device.

An intermediate is a person whose profession is not in the computing field, but through coursework and/or experience has developed expertise with a variety of computing applications.

A professional is a person whose profession is in the computing field, such as a programmer, systems analyst, operator, computing faculty member, or data base administrator.

Assumptions

An assumption will be made that the respondents who furnish information regarding their concerns about computing on the open-ended statements of concerns and questionnaires are providing accurate and honest expressions of their sentiments.

Limitations of the Study

Stratified convenience samples will be used to provide representatives of various categories of computer users. However, the generalizability of the conclusions from the study will be limited because of the inability to obtain a true random sample of representatives of all categories of computer users.

Summary

A description of the problem to be studied was presented in this chapter. A succinct portrait of the necessity to address the conditions that accompany technological innovation was presented. A brief overview of the

development and application of the Stages of Concern model was tendered as a framework for conceptualizing the change process as it relates to computer users. Certain definitions and limitations of the study were identified.

Chapter II contains a review of literature relevant to the application of the Stages of Concern model as a feasible approach to understanding change theory as it relates to computer users. Chapter III includes a description of the methodology which was followed in the development of the instrument which was tested in this exploratory study. A description of the design of the study and the procedures used will also be included. The findings of the study are presented in Chapter IV, and the conclusions and recommendations of the investigator are reviewed in Chapter V.

CHAPTER II
LITERATURE REVIEW

Introduction

Technology has invaded almost every aspect of the human existence in a modern society. This invasion has brought with it tremendous changes in how people conduct themselves in their personal and professional lives. Change is frequently accompanied by a certain amount of concern. The purpose of this study is to focus on the concerns of users of computers through the employment of the Stages of Concern model. More specifically, it is to determine if there are Stages of Concern among computer users and, if so, to develop a valid and reliable instrument that can be used to identify them. The first section of this literature review focuses on some of the primary contributors in the area of change theory. The second section highlights the contribution of the development of the Teacher Concerns Model and the instruments that have been used to assess those concerns. The third section is devoted to a description of the research procedures employed to demonstrate the concept of sequential stages of concern in the process of the adoption of an innovation which is incorporated in the Concerns-Based

Adoption Model (CBAM). The fourth section is an exploration of the extension and diversity of concerns-based theory. The fifth section is a review of literature that is related to the apprehension, anxiety, and concerns of computer users.

Change Theory Models

One of the best known researchers in the development of change theory models is Havelock (1971). He proposed three different structures for understanding change: the Social Interaction Model; the Research, Development, and Diffusion (R,D&D) Model; and the Problem Model.

The focus of the Social Interaction Model was on the diffusion of user involvement from person to person throughout the social system and understanding the five decision phases through which an individual migrates sequentially in the adoption process. "The diffusion of the innovation depends greatly upon the channels of communication within the receiver group, since information about the innovation is transmitted primarily through the social interaction of the group members" (Havelock, 1971, p. 29). Rogers' (1962) conceptualization of social interaction has been the one most used when studying innovation adoption within this framework. The first phase is an initial awareness of the innovation, followed by an interest in learning more about it. A decision is made in the third phase, evaluation, about the adoption of the innovation. The last two phases are trial and then adoption.

Havelock (1971) identified Mort, Carlson, and Ross as major advocates of the social interaction approach in education. He further noted that the Model is based largely on rural sociology tradition studies (Havelock, 1971).

The R,D&D Model depicts the change process as "an orderly sequence which begins with the identification of a problem, proceeds through activities which are directed towards finding or producing a solution to this problem, and ends with diffusion of this solution to a target group" (Havelock, 1971, p. 39). This approach begins the study of the change sequence at an earlier time then does the previous model. The five basic assumptions upon which this model (Havelock & Havelock, 1973) is guided are as follows: (a) that a rational sequence exists in the formulation of an innovation which should include research, development, packaging, and dissemination; (b) that an enormous amount of planning takes place over a considerable length of time; (c) there is a division and coordination of labor that corresponds with the first two assumptions; (d) there is a passive but rational consumer who, if it is presented to him or her in the proper manner, will accept and adopt the innovation; and (e) a high initial development cost of the innovation is acceptable because of the efficiency, quality, and appropriateness for mass audience dissemination.

One of the best known adaptations of this model is that of Guba and Clark (1976). It includes detailed descriptions

of objectives and activities which can be used to foster the basic objectives of the R,D&D Model.

The Problem Solver Model provides the foundation for group theorists and Organizational Development (OD) proponents. This approach "includes studies which focus on the efforts of a receiver in solving his own particular problems" (Havelock, 1971, p. 69). The basic tenants of this approach (Havelock & Havelock, 1973) include: (a) the user's need is the major consideration in any planned exercise; (b) diagnosis of user's needs is an essential aspect of the change process; (c) a nondirective approach with users is essential; (d) there should be complete utilization of internal resources; and (e) commitment to change is likely to be stronger if initiated by the user or there is at least real user involvement.

Perhaps the earlier work of Lewin (1951) laid some of the groundwork for this approach to change. The three major stages in the change process that he outlined were unfreezing, moving, and freezing. Lippitt, Watson, and Westley (1958) expanded upon Lewin's change model by redefining the stages of change. They also presented a rational conception of the "change agent," a person who possesses the skills required to assist a client with problems encountered as change takes place. Havelock (1971) suggested that the "change agent" or problem solver must act in a collaborative manner in order to really be effective.

The OD strategy for planned organizational change falls within the framework of the Problem Solver Model. The focus of this approach is on group interaction rather than on the individual (McGill, 1977). The basic assumptions about the individual, groups, and organizational systems underlying OD principles are generally in congruence with the theories of McGregor (1967), Likert (1967), Argyris (1964), Herzberg (1966), and Bennis, Benne, and Chin (1961).

OD strategies can be used to facilitate change in such diverse settings as business firms, school systems, American Indian tribes, labor unions, governmental units, service organizations, and research and development laboratories (French & Bell, 1978). An important OD study in school systems is that of Schmuck, Runkel, Arends, and Arends (1977), which noted the interdependence of people working on tasks and the collaboration among individuals and groups that takes place in that setting.

Clearly, educational institutions pose a most challenging backdrop for the study of innovation adoption. A basic mission of these institutions is to foster change by aiding their charges to grow and develop. The ability to carry out this goal in an optimal fashion has been the subject of considerable research. Fullan (1982) draws heavily on the literature regarding educational change in order to aid the reader in understanding the complexities of the process. One area of this research has focused on the

education of teachers. The next section presents the development of a Model for recognizing and assessing concerns of education students.

The Teacher Concerns Model

Fuller (1969) summarized her research regarding concern about the benefit that students were obtaining from education courses as follows. She defined "concerns" to include such emotions as motivations, perceptions, attitudes, feelings, and mental gymnastics indulged in by a person when confronted with a new process or product. Fuller was aware that students are more motivated to learn material that is of interest to them and disinclined to learn that which is considered to be less relevant. This phenomenon was confirmed by her in a pilot study involving 100 education students who were queried about the preparation they had received in education courses. During the hour-long individual interviews, 97 of the students made deprecating remarks about a certain introductory education class. All of these students were young undergraduates without teaching experience. However, three of the students were quite enthusiastic about the course. These students had substantial teaching or similar experience and were middle-aged. Two explanations were offered to account for the difference in perception about the class. One possibility is that the class was worthless. A second possibility is that many of the students who enter education

programs are not prepared to benefit from them as they are now taught, and the structure of the traditional teacher education program may not be the most appropriate model for educating student teachers.

Fuller conducted another study to explore what teachers are concerned about and to ascertain if the concerns should be conceptualized into a helpful framework. She found it remarkable that there was so much consistency in the findings of earlier investigators, particularly since they had surveyed such diverse populations. Such concerns as class control, feelings of self-adequacy, evaluations by supervisors, and their teaching environment were noted. However, these concerns were not the ones being addressed. She hoped that her study would help educators to better understand this discrepancy.

The study used counseling seminars conducted by a psychologist. The psychologist met a group of six student teachers for two hours each week during the students' teaching semester. The following semester a group of eight student teachers were involved in the counseling sessions. This time there was co-counseling in order for the two psychologists to insure that opportunities for expression were not hampered. Yet another group of seven students was similarly counseled during the third semester. The results of these counseling sessions indicated that there were two main categories of concerns: concerns about self, including

self-adequacy and self-protection; and concerns about pupils, their learning and their progress. Self-concerns predominated during most of the semester. Only towards the end of the semester did concerns shift to the pupils.

An additional study was undertaken with 29 students. They were asked to write about what they were concerned about at the time. The groups were surveyed at approximately two-week intervals during the course of the semester. Of the 29 students, 22 communicated concerns primarily about self-adequacy, six students expressed both self and pupil concerns, and one expressed pupil only concerns.

The aforementioned studies, along with a review of research carried out by other investigators, led Fuller to believe that there was sufficient evidence to support the beginnings of a developmental conceptualization of teacher concerns. She suggested three distinct phases: a pre-teaching phase, an early teaching phase, and a late teaching phase. In the first phase, students did not appear to know what their concerns were. The concerns were anticipatory or apprehensive, but rarely specific to teaching. In the second phase, the concerns dealt with self. Questions involving how to handle the job, how much administrative support to expect, and working relationships were paramount. There was a need to understand the parameters of the task. Along with these covert concerns were overt concerns such as ability to control a class,

knowledge of subject content, and the ability to contend with evaluation. The third phase was evidenced by concern with pupil progress and evaluation of one's own contribution to that progress. These concerns could be clustered into four distinct categories: concerns unrelated to teaching, concerns about self in relation to teaching, concerns about the task of teaching, and impact concerns. There was also evidence to suggest that a person traversed sequentially through the various concern stages from self, to task, to impact. Although Fuller had been able to make headway in the conceptualization process, she realized that the personal counseling interviews were extremely time consuming and required considerable effort by highly trained personnel.

As a result, the Teachers Concern Statement (TCS) was developed. Because of its open-ended nature, the TCS does not restrict teachers to specific concerns; instead one broad question is asked: "When you think about your teaching, what are you concerned about?" The teachers are provided with an 8.5" x 11" sheet of paper and given 10 minutes to respond. The statements are scored by indicating one of six teaching concerns categories or one non-teaching category (Fuller & Case, 1972). This instrument enhances the process of eliciting teacher concerns but is time-consuming to score and requires significant preparation by the coder. Further research by Fuller and others (George, 1978) resulted in the development of an instrument called the Teachers Concern

Checklist (TCCL). It is a quick-scoring questionnaire that consists of 56 items. A five-point Likert scale with ranges of 0 (not concerned) to 5 (extremely concerned) is used to assess the degree of concern about each item. It is scored by summing the responses on certain items to obtain the five scale scores.

Following the development of the TCCL, a Teacher Concerns Questionnaire (TCQ) was developed and subsequently validated, that would measure self, task, and impact concerns of teachers about teaching. The TCQ consists of 15 items which are also on Form B of the TCCL. Therefore, the 56-item TCCL-B can also be used to assess self, task, and impact concerns.

Stages of Concern About the Innovation

During the 1969-70 academic year, staff members of the Inter-Institutional Program of the Research and Development Center for Teacher Education at the University of Texas at Austin (UT R&D Center) realized that teachers and professors who were experiencing change appeared to have the same type of "concerns" that Fuller had identified relevant to teaching. However, the concerns in this case were those encountered when any type of educational innovation was to be adopted (Hall et al., 1973). UT R&D Center staff members realized that change encompasses technical problems involved in the adoption of an innovation (including both processes and products) and the personal needs of the individuals

involved. Through the 1970s, a series of studies were done to test the model and related hypothesis about intervention (Hall & Loucks, 1978; Hall & Rutherford, 1976). The result of the work conducted by these researchers was the development of a conceptual model referred to as the Concerns Based Adoption Model (CBAM).

Certain assumptions were made based upon considerable experience derived from involvement in innovations in colleges and school settings. These assumptions are fundamental to the CBAM in that they establish the perspective for viewing the change process (Hall & Loucks, 1978):

1. change is a process, not an event, and it takes time to institute change;

2. individuals must be the focus if change is to be facilitated, and institutions will not change until their members change;

3. the change process is an extremely personal experience, and how it is perceived by the individual will strongly influence the outcome;

4. individuals progress through various stages regarding their emotions and capabilities about the innovation;

5. the availability of a client-centered diagnostic/ prescriptive model can enhance the individual's facilitation during staff development;

6. people responsible for the change process must work in an adaptive and systematic way, and progress needs to be monitored constantly.

The Concerns-Based Adoption Model addresses all of these assumptions: the individual's concerns about the innovation, the specific manner in which the innovation is used, and the adaptation of the innovation to the individual. The current study is based primarily on the first of three diagnostic dimensions in the model, which is the individual's concern about the innovation.

Based upon research conducted earlier by Fuller and others, it was possible to identify seven distinct Stages of Concern About an Innovation that an individual is likely to encounter as he or she moves through the change process (Hall & Loucks, 1978) (see Figure 1). As the study findings emerged, it became clear that an individual can have concerns in more than one stage at a time and that typically some stages are more intense than others. A profile of concerns could be talked about as the innovation is implemented. Further, there is a hypothetical change in the shape of the concerns profile as the change process unfolds. Initially the stage 0, 1, and 2 concerns are most intense. Ideally, once implementation actually begins to take place, Management concerns, stage 3, increase in intensity and stages 0, 1, and 2 become less intense. In the final stages, 4, 5, and 6, Impact concerns, can become more intense and Management concerns abate.

6 REFOCUSING: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

5 COLLABORATION: The focus is on coordination and cooperation with others regarding use of the innovation.

4 CONSEQUENCE: Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

3 MANAGEMENT: Attention focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.

2 PERSONAL: Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

1 INFORMATIONAL: A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

0 AWARENESS: Little concern about or involvement with the innovation is indicated.

Figure 1. Stages of Concern About the Innovation.

Adapted from Hall and Hord, 1987. (Original concept from Hall, Wallace, & Dossett, 1973).

In order to assess user concerns, additional research into the concept of Stages of Concern (SoC) focused on the creation of a reliable and valid instrument; the SoC Questionnaire is the product of that work (Hall et al., 1979). The SoC Questionnaire provides the user with the ability to quickly measure the Stages of Concern of teachers and professors. The validation study took place over 3 years, in addition to the 10 years of research conducted by Fuller. Several different formats and methodologies initially were considered. "The resulting SoC Questionnaire was tested for estimates of reliability, internal consistency, and validity with several different samples and 11 different motivators" (Hall, George, & Rutherford, 1979, p. 9).

The first pilot instrument designed to measure concerns individuals might have about an innovation was developed in the fall of 1973. It consisted of an open-ended concerns statement and required a forced ranking. Variations of this format, adjective checklists, interviewing, and use of Likert scales were all contemplated. However, two instruments ultimately surfaced by the spring of 1974 for measuring Stages of Concern: the primary instrument (the SoC Questionnaire) and the Open-Ended Concerns Statement developed by Newlove and Hall (1976).

Open-Ended Statements of Concern

Newlove and Hall (1976) developed a direct and easy method for ascertaining the concerns of users and nonusers about an innovation called the Open-Ended Statement of Concern About an Innovation. This format was the one pioneered by Fuller and Case (1972). Individuals were requested to respond to the question: "When you think about [the innovation], what are you concerned about?" The purpose was to develop a broad overview of the individual's concerns. The instrument was intended to provide a fast and easy method to assist a workshop leader or change facilitator with a technique for identifying the concerns of his or her clients in their own words, which meant a trade-off in comparison to a more scientific instrument capable of "pinpoint" accuracy.

The developed instrument is composed of three pages (see Appendix A). The first page provides information about the question being asked. It also provides a means, other than a name, for identifying the respondents. The second page contains the question, an area for the response, and space for scoring the response. The last page is used to collect any additional data that are considered important.

The responses to the open-ended question are read through completely in order to gain a general insight into the affect, motivation, and needs of the respondent. The analyst attempts to identify the concerns as self-, task-, or impact-related, or unrelated to the innovation at all. If

desired, the content analysis can be made more systematic by scoring the concerns according to the Stages of Concern enumerated in Figure 1. Each idea is recognized as a separate unit and is assigned a number that coincides with the appropriate stage of concern. The numbers are not to be averaged as that would provide a distorted picture of the data and would be meaningless.

The Stages of Concern About the Innovation Questionnaire

The Stages of Concern Questionnaire, unlike the Open-Ended Statement of Concern, does not rely on the articulateness of the respondent. The instrument now has been used extensively in concerns research involving many different innovation adoption situations. The instrument developers collected more than 500 statements of concern about an innovation from college professors and teachers. Those statements were subjected to a Q-sort procedure which resulted in the identification of 195 statements that represented the seven hypothesized stages of concern. The statements became the items on a prototype questionnaire that was administered to college professors and teachers who were involved in implementing innovations.

Factor analysis using VARIMAX rotation was used on the data (N = 366) which resulted in the identification of seven factors corresponding to the seven hypothesized stages. Subsequently a 35-item Stages of Concern Questionnaire was developed comprised of those five items that loaded highest

on each scale. The items representative of each stage on the questionnaire were selected in a way that enhanced the likelihood that the instrument would have high internal reliability. Respondents are asked to rate each item on a zero (not true of me now) through seven (very true of me now) scale as a means of indicating the degree to which that item reflects their own present concerns. The scoring procedure begins by adding the circled responses for the five items on each scale. The total of these scores is the total raw stage score (George, 1977). Additionally, percentile tables were established which allow the stage scores to be converted into percentile scores. Peak or predominant stages of concern, and the relative intensity of the other concern stages, can then be plotted from the percentile scores (Hall & George, 1980).

A number of innovation studies were conducted during the mid-1970s to test the validity and reliability of the SoC Questionnaire. Internal validity was examined using Cronbach's alpha procedure on a large sample of data (N = 830) supplied by teachers involved with team teaching and professors who expressed their concern about the innovation. A subsample of teachers (N = 132) participated in a test-retest of the questionnaire over a two-week period. Alpha coefficients ranged from .64 to .83, and test-retest correlations ranged from .65 to .86. This would indicate that the instrument had internal consistency and stability for each of the seven stages (Hall et al., 1979).

Since no other instruments for measuring the conceptualized concerns existed, the validity of the scores as measures of concern could not be established by using a comparison method. An indication that the questionnaire did measure concerns, as they were defined in the model, was demonstrated initially through a check of the intercorrelation of the scale scores on both the original 195-item prototype questionnaire and the 35-item SoC Questionnaire. The scores correlated with each other in the manner that would be expected if they formed a developmental sequence as hypothesized. Guttman referred to this as the simplex pattern. Each stage seems to be most like those stages contiguous to it, and this suggests that the sequence of concerns stages might well be developmental (Hall et al., 1979).

Subsequently, researchers attempted to measure the relationship between the estimated assessments of concerns (based on either taped interviews or open-ended statements) and raw stage scores. The findings of these studies were not consistent. However, a relationship was shown between the SoC Questionnaire raw stage scores and the estimates of peak or prominent stage of concerns (based on interviews or open-ended data). In one of the most rigorous of these studies, findings indicated that six of the seven stages of concern were supported by significant correlations (George, 1977; Hall & George, 1980).

Convincing evidence of the validity of the SoC Questionnaire has been demonstrated through several longitudinal studies. The findings of one study indicated that significantly lower early stage concerns were reflected in responses of teachers who had attended a five-week summer workshop devoted to a new approach to reading instruction than in the responses of teachers who had not attended the workshop (but had received a one-day introduction to the approach). In other studies, assessments of concern at various times, prior to and after the introduction of an innovation and innovation workshops, indicate that the SoC Questionnaire measured a decrease in lower stage concerns and an increase in higher stage concerns than might be expected as a result of the experience (George, 1977; Hall & George, 1980).

Extension and Diversity of the Stages of Concern Model

Since the mid-1970s, the Stages of Concern dimension of the Concerns-Based Adoption Model has been applied in a large number of diverse change efforts in the United States, Canada, Australia, Belgium, the Netherlands, and other countries. Although Fuller envisioned concerns data as being used in the development of more relevant educational programs, CBAM has proven to be a framework that can provide a structure for successfully implementing change in a broad range of applications. Members of the original research group, as well as others, have used and refined the basic

concepts developed earlier in the context of the educational environment. Other researchers have extended certain components of the model outside of the traditional educational setting, including private sector settings.

Some recent studies incorporating the concerns-based model include a description of the concerns that principals have about facilitating change (Rutherford, Hall, & Newlove, 1982); an intervention used to aid in the implementation of a new curriculum program in a Tampa public school system (Nielsen & Turner, 1986); a conceptualization of strategies in order to facilitate understanding and addressing personal concerns of teachers (Marsh & Jordan-Marsh, 1985); a presentation of a new concept for facilitating leadership teams with certain characteristics (Hall & Hord, 1986); a presentation of three vectors that can be used to determine if the innovation has been established in the institution (Hord & Hall, 1986); and a report on how the use of all of the components of CBAM can provide the basis for facilitating change at individual and institutional levels (Hall & Hord, 1987).

In addition, there are several current books founded upon the principles of CBAM. The books include Taking charge of change (Hord, Rutherford, Huling-Austin, & Hall, 1987) and Change in schools: Facilitating the process (Hall & Hord, 1987). Further evidence of the diversity of the model is represented by its extension into the field of nursing,

health, recreation, and the leadership component at the United States Air Force Academy.

A 1983 study by Kolb resulted in the development and application of a Nurse Concerns Questionnaire. Kolb had extensive experience in nursing and nursing education. She conjectured that a pattern of concerns existed among prenursing students, nursing students, and practicing nurses that was similar to the self, task, and impact concerns identified by Fuller and later expanded upon by Hall and his associates. Kolb used the same methods and procedures that had been used in the creation of the earlier concerns questionnaires. She was able to determine that there were identifiable stages of nursing concerns and developed a valid and reliable Nurse Concerns Questionnaire that could measure those stages. The study that Kolb conducted allowed the following research questions to be answered:

1. Are there identifiable Stages of Concern among prenursing students, nursing students, and practicing nurses?

2. Can an instrument for assessing Stages of Concern among nurses be developed which is both valid and reliable?

3. Is there a sequential relationship between predominant Stages of Concern among nurses and phase of professional preparation?

4. Are there significant differences in the focus of concerns among prenursing students, nursing students, and practicing nurses in relation to type of generic program?

5. What are the patterns of Stages of Concern among nursing students who have had previous paid patient care experience?

6. What are the patterns of Stages of Concern among nurses in relation to selected facets of professional practice?

In general, Kolb's findings supported the earlier research about concerns theory. First, there was considerable similarity between the seven stages of concern identified by Kolb and those established by Hall and his associates relative to the adoption of an educational innovation. Second, a reasonably reliable and valid 35-item instrument was developed following the procedures used in prior concerns research. Third, there appeared to be a sequential ordering of the earlier stages of concern that coincided with professional preparation. However, the pattern of additional years of experience paralleling higher stages of concern did not seem to hold true.

The implications from this study are several. Kolb advanced the following views: understanding and accepting concerns differences among different categories of nurses will aid nurse educators to cope with and resolve self concerns of their students, and also allow them to derive applicable instructional strategies; and understanding concerns differences among nurses will promote cooperation among nurses who are at disparate stages of concern. Kolb

(1983) also indicated that the findings of the study provided additional support and knowledge of concerns theory. Changes made to the original Stages of Concern definitions reflect the nursing emphasis of the study (see Figure 2).

Barucky (1984) completed an extensive research study, like Kolb, following the procedures and methodology advanced by Fuller and Hall and associates in the development of the SoC Questionnaire. However, the goal of Barucky's study was to determine whether concerns theory applies to leadership training in Officer Professional Military Education (PME). His intent was to develop a valid and reliable questionnaire that would assess the stages of concern about leadership skill development among various categories of students attending U.S. Air Force officer PME programs. The Barucky study allowed the following research questions to be answered:

1. Do identifiable stages of concern about development of their personal leadership skills exist among participants of Air Force pre- and postcommissioning PME programs?

2. Are these stages consistent with those found in earlier concerns research?

3. Can a valid and reliable instrument for measuring stages of concern be developed?

4. Do these stages of concern correspond to the degree of leadership experience so that (a) respondents reporting no leadership experience will have concerns reflecting "early"

0 CONTEXTUAL: Concerns are indirectly related to nursing but are not specific to either the study or the practice of nursing. The concerns expressed have their origins within the context of the individual's involvement in nursing.

1 INFORMATIONAL: Focus of concern reflects an interest in learning more about what nursing involves.

2 PERSONAL: Concerns are reflective of an uncertainty about the demands of nursing and about personal adequacy to meet those demands. This includes concerns about personal status, financial adequacy, and public opinion of self.

3 MANAGEMENT: Concerns are focused on process and tasks involved in the provision of nursing care. This includes concerns about organizing time and resources in relation to the tasks to be completed.

4 CONSEQUENCE: Attention focuses on the impact of care in terms of patient outcomes within the individual nurse's immediate sphere of influence. This includes concerns about personal or professional changes which can be made that will have a positive effect on patient outcomes.

5 COLLABORATION: Focus is on coordination and cooperation with other nurses and other health care professionals, with the goal of improved patient outcomes. This includes concerns about collaboration between education and service.

6 REFOCUSING: Focus of concerns is on broader professional issues. What changes can be made--self, other nurses, and in nursing care. This includes concerns about changes in career as an alternative to the existing state.

Figure 2. Stages of Concern of Nurses.

stages to a greater extent then respondents with considerable experience, and (b) those reporting considerable experience reflecting "later" stages to a greater extent than those reporting no experience?

5. Do differences among concerns stages exist among respondents based on the type of PME program currently attended?

6. Do differences in concerns stages exist among respondents attending the same type of PME program, based on amount of leadership experience?

Again, the results of the Barucky study, like the Kolb study, generally supported the concerns theory findings established in earlier research. First, there was similarity between the seven stages of concern identified by Barucky and those established through prior educational innovation and nursing concerns research. Second, a reasonably reliable and valid 35-item instrument was developed following the procedures used in prior concerns research. Third, there appeared to be a sequential ordering of the earlier stages of concern that coincided with professional preparation. The response pattern indicative of the developmental nature of concerns stages was most strongly supportive of stages 0, 1, 2, and 6.

A major implication of this study was that concerns theory can be extended to leadership training in officer PME programs. There is also evidence to suggest that independent

concerns stages exist in the leadership framework. Again, changes made to the original Stages of Concern definitions reflect the U.S. Air Force leadership program emphasis of the study (see Figure 3). Further, the stages of concern identified in this study are very similar to those identified in previous educational innovation and nursing concerns research, and thus the benefits accrued from this knowledge base are likewise considerable.

Researchers in Belgium and the Netherlands developed a Flemish language 52-item version of the Stages of Concerns Questionnaire and have used it in major educational change efforts in those countries (Vandenberghe, 1983). Although this instrument has a somewhat different focus, it also measures seven stages of concern.

Marsh and Jordan-Marsh (1985) argued that understanding the psychological dimensions of change, as well as the sociological dimensions of change, offers additional ammunition for helping teachers cope with personal concerns in the innovation implementation process. Marsh and Jordan-Marsh used psychological literature on decision making, primarily Janis and Mann (1976) and Bandura (1981), to aid in developing ideas that could lead to the development of interventions to address personal concerns.

In addition, Jordan-Marsh (1985) adapted the Stages of Concerns Questionnaire to reflect the concerns of participants in an exercise program. The resultant

0 NON-LEADERSHIP CONCERNS: These concerns reflect either lack of current concern for developing leadership skills or the feeling that development of these skills is in conflict with, or is overshadowed by, other priorities.

1 INFORMATIONAL: These concerns reflect a need for more general information about leadership. They do not seem to imply a feeling of inadequacy but rather an open desire to know more about what leadership entails, what the role of a leader is like in the air force, and the differing environments that air force leaders will face.

2 PERSONAL: These concerns center on the demands or requirements of a leadership role and reflect some question/uncertainty about whether the respondent can fulfill these demands adequately or possesses necessary leadership skills. This stage also includes concerns about how the respondent will be perceived by others or whether she/he will be liked, respected, or followed.

3 MANAGEMENT: These concerns relate to mastery of the specific tasks, skills, or behaviors perceived as necessary to be an effective leader. They also include concerns about situational obstacles, such as time, resources, or organizational support, that may interfere with the mastery of these areas.

4 CONSEQUENCE: These concerns focus on the effect of the respondent's leadership behavior on either the welfare and needs of other people, or on achieving the overall mission of the organization.

5 COLLABORATION: The focus of these concerns is on coordinating and cooperating with others in an attempt to refine leadership skills and/or to improve the quality or positive effects of leadership or leadership development programs.

6 REFOCUSING: These concerns revolve around the improvements needed in either the general philosophy or the practices involved in leadership or leadership training. They include those factors that detract from the quality of Air Force leadership training and those changes that may enhance the understanding and performance of our leaders.

Figure 3. Air Force Office PME Program Participants' Stages of Concern About Leadership Skill Development.

instrument, the Stages of Concern for Exercise (SOCE) scale, was designed to better understand the high rate of attrition which occurs in these programs. It can also be used as an example to illustrate the adaptability of the original model to a wide range of uses.

Concerns Among Computer Users

John R. Grey (in Darlin, 1985), Chevron Corporation president, required that the organization's top executives learn about personal computers even though they might never be required to use them. Grey wanted them to understand how the people who use computers feel. However, executives who have this type of concern over employees' feelings are still a rarity (Darlin, 1985). Anxiety and apprehension apparently are not uncommon emotions for some individuals when computing is at issue. In addition, depersonalization, loss of privacy and fear are often associated with the use of computers (Meier, 1985). Oborne (1985) wrote about the societal implications of the technology as well as the impact in the workplace. Brod (1984) interviewed people who work with computers in a variety of ways, including clerical workers, chief executive officers, computer programmers, and others. He consistently found that computers were having a striking effect on their professional and personal lives. Not only were there identifiable stress reactions such as fatigue and headaches, they seemed to be internalizing the principles by

which the computer works: accelerated time, a need for perfection, and yes-no thinking patterns.

There have been a number of attempts made to measure the attitudes of people towards computing. Nickell and Pinto (1986) created the Computer Attitude Scale (CAS), a 20-item five-point Likert scale questionnaire, to measure positive and negative attitudes about the use of computers. Fleischer and Morell (1985) used interviews of managers to collect data to assess the impact of the change brought about by office automation. Sproull, Zubrow, and Kiesler used a 61-item attitudinal questionnaire (later a short instrument was developed) to better understand the socialization experience involved in computing. Turkle (1984) and Caporael (1986) chose to study the man/machine computing relationship by investigating the anthropomorphism that frequently takes place. Gallo (1986) suggested that expectancy theory could be used as a predictor of behavior when confronted with computer technology.

However, there is one characteristic that all of the procedures and methodologies reported in these studies have in common, and that is that they approached the subject of computing from a very narrow perspective in comparison to that which is found in the concerns-based model. Therefore only one, or at most a few dimensions, of the dynamics that occur in computing was investigated. The focus of most of these studies was on the apprehension, anxiety, and fear that

beset some people when they are confronted with using a computer. Clearly this is an important aspect of the computing experience, but it is only one aspect. Once the concerns about "self" are addressed other concerns increase in intensity. Concerns theory provides the systematic framework necessary to venture beyond the personal anxiety level, and therefore advance the understanding of the change process that is encountered with the use of a computer. None of the other research was based upon such an encompassing structure. Consequently their limited approach to the multidimensional aspects of computing renders them insufficient as a framework for this study.

There have been occasions when the original SoC questionnaire was used with teachers when microcomputers were to be introduced into their curriculum (Cicchelli & Baecher, 1985, 1987; Wedman, 1986; Whiteside & James, 1985/1986). The strategy was to replace occurrences of the word "innovation" with microcomputer when it appeared in the questionnaire. However, following the same procedure for this study, although considered, was deemed inappropriate since most of the respondents would not be teachers or others acting in an instructional capacity. In addition, the data gathered in Phase I (described in Chapter III) of this study clearly indicated that the original SoC was not adequate to capture the concerns of a wide range of computer users.

A Pilot Study

Tentative confirmation of the foregoing conclusions was made during the spring of 1987 when this investigator conducted a qualitative study designed to uncover the methods that computing students use to obtain help in a laboratory setting. Numerous observations in a microcomputer lab were conducted. During those observations the investigator attempted to become as inconspicuous as possible by ostensibly working at one of the computers in the rear of the room. Although this method supplied some information, it was not a sufficient method to understand the scope of what actually transpired. A series of in-depth interviews were then conducted in order to more clearly understand what was taking place. Three students, two females and one male, who had never before used a computer, volunteered to be interviewed periodically during the semester and report on their perceptions, as they learned to use the computer. Six other students, three females and three males, with moderate to substantial amounts of computing experience were also interviewed. The interview methods and the subsequent analysis of the data followed that outlined by Spradley (1980). Spradley's procedures involved such undertakings as participant observation, taxonomic analysis, and componential analysis.

As a result of using this methodology, this investigator was able to uncover certain patterns of behavior. The

initial statements of the inexperienced students were either unrelated to their own personal use of the computer or were ones expressing apprehensions about their adequacy in the use of the technology. The more experienced students' statements tended to focus primarily on the computing resources such as hardware and software or on the possibly exorbitant amount of time involved in completing a task. They also reported having a certain amount of anxiety when they had to make major system changes and at the thought of taking certain computing courses that had a reputation for being particularly demanding. Totally unaware of the concerns-based model, this investigator used the terms self and task to identify the primary types of statements made. Experience was cited as a factor when behavior was categorized (Martin, 1987). This study lends encouragement to the hypothesis that the concerns model is an appropriate one for assessing concerns about computing.

Much of the research (Allen, 1986; Fritz, 1985; Martin, 1987; Martin & Martin, 1988; Meier, 1985; Nickell & Pinto, 1986; Sanders, 1986; Schubert, 1986; Sproull, Zubrow, & Kiesler, 1986; Wallace, 1986; Wheeler, 1986) reviewed during this preliminary phase cited evidence that a gender difference exists relative to the amount of self concerns reported. Females appeared to have greater anxiety than did their male counterparts. The ramifications of this condition could be considerable, affecting curriculum choices, career

choices, and advancement in employment. However, the teacher can be the key to a successful computing experience (Adams & Fuchs, 1986; Fritz, 1985) and therefore may be a mitigating force in minimizing negative affects of the innovation through thoughtful interventions.

Summary

In this chapter, the three different perspectives--the Social Interaction Model; the Research, Development and Diffusion Model; and the Problem Solving Model--as tendered by Havelock, were used as a framework to present representative literature regarding change. Each model presents a view of the process from disparate viewpoints. Although there is some overlap, the basic assumptions among the three approaches are distinctive. This was followed by a review of the evolution of concerns theory as a model for change. The model was traced from its conception in teacher preparation programs to its application in various educational settings, nationally and internationally, nursing education programs, the health field, and leadership skill development in the Air Force.

Literature in the area of emotional reactions related to computer use was also surveyed in this chapter. There is evidence in the researcher that a gender difference exists relative to the amount of "self" concerns reported. However, most of the studies focused on the distress encountered when personal involvement with the technology is considered. The

majority of the research takes a narrow view of the concerns associated with the use of the technology. Concentration is on fear, apprehension, anxiety, and other discomforts suffered as part of the computing experience. This single dimension viewpoint is predominant in the related literature. This investigator's practical experience in computing education and a study using college students provides some credence to the concept that concerns patterns are similar to those patterns found in earlier concerns research. Thus, a certain amount of support is evident to imply that concerns theory may be applicable to the computing experience and, therefore, this study was proposed to determine if the Stages of Concern Model is an appropriate conceptual model to assess concerns among computer users and to determine if an instrument for measuring the concerns can be developed.

CHAPTER III
RESEARCH DESIGN

Organization

Problems to be investigated in this study included determining whether the Stages of Concern Model is an appropriate framework to assess concerns among computer users; determining whether an instrument for assessing Stages of Concern among computer users can be developed within the framework; determining if there is a relationship between the level of computing education and the sequence of concern stages; determining whether there is a relationship between the intensities of various concern stages and the computing application experience level of an individual; determining the associations between age/gender and SoC scores; and determining what effect a major system or software change has upon a computer user's concern stage and concern sequence.

Because a priority in this investigation was to determine if the Stages of Concern Model is an appropriate conceptual model to assess concerns among computer users, the research design used in this study parallels the procedures that were used in the prior related studies (Barucky, 1984;

Hall, George, & Rutherford, 1979; Kolb, 1983). In this chapter, the procedures followed in the three phases that comprise this exploratory study are described. Phase I encompassed the identification of concerns that people have about computer use. Phase II included the construction and administration of a 78-item preliminary questionnaire designed to determine the stages of concern of people about computers. A final 32-item questionnaire was developed as a result of the analysis of the data collected using the preliminary questionnaire. Phase III included the administration of the 32-item final questionnaire and an analysis of the data. Each of the instruments developed in Phase II and Phase III also included the construction of a cover page, with directions for completing the questionnaire, and a demographic information page. In addition, this chapter includes a discussion of the data analysis methodology, a description of the method used for data collection within the context of the three phases, and a description of the study population.

Phase I: Identification of Computer Concerns

This investigator, without prior knowledge of concerns theory, had found evidence to suggest that students had concerns that clustered into certain categories--primarily those of self and task (Martin, 1987). However, the data obtained from the interviews and observations that were conducted in that pilot study, as described in the prior

chapter, were not sufficient to provide the broad range of items necessary to develop an instrument for assessing stages of concern about computing. An investigation similar to those carried out by Newlove and Hall (1976), Kolb (1983), and Barucky (1984) would be necessary in order to obtain a greater variety of computing concerns data and determine if the responses supported or refuted the earlier findings.

An open-ended statement-of-concern form was developed that followed the guidelines provided in A Manual for Assessing Open-Ended Statements of Concern About an Innovation (Newlove & Hall, 1976). In the fall of 1987 and spring of 1988, these forms were distributed by the investigator to individuals at two different higher education institutions located in the same city. Because of the high incidence of part-time older students at one of the institutions, the investigator was able to collect data from mature adults who possessed varying amounts of experience. Having this population to draw upon, along with the traditional 18 to 21 age group at the second institution, provided a greater range of individuals than might be obtained from a single institution of higher education. Professionals in the computer centers at both institutions also provided information through the open-ended statement of concern form. Participants were informed that their responses were both anonymous and voluntary. No attempt has been made or will be made to match responses with individuals.

Some modifications were made to the original open-ended statement form after voluntary comments made by some of the respondents, when queried about the clarity of the form, were assessed. The majority of the changes were made in the explanatory cover paragraph to more fully reflect the computing emphasis of the instrument. Further modifications were made to the demographic information sheet when it was decided to focus attention on all computer users and not just students. The open-ended concerns instrument (Appendix B) used to collect data closely resembles those used by Newlove and Hall (1976), Kolb (1983), and Barucky (1984).

There were 222 usable responses returned from this stratified convenience sample. The data collected through this method were used to test for corroboration of information gathered through observation and in-depth interviews and substantially augmented the findings of the pilot study (Martin, 1987) that was described in the previous chapter. Further, the data provided the basis for the concerns statements that were included in the instrument developed for this study (Phase II and Phase III).

Results from the 222 sets of concerns data were analyzed according to the specifications in the Newlove and Hall Manual (1976). The analysis process produced sufficient confirmation to support the view that concerns about computing correspond with the self, task, and impact stages

that were defined in prior concerns models. In addition, there appears to be ample evidence that concerns about computing appear to progress in a sequential pattern from self to task to impact. Those individuals who have the greatest and most varied amounts of experience tend to have concerns that cluster more to the advanced stages of the model.

Phase II: Discussion of 78-item Instrument

The development of a valid and reliable instrument for assessing the stages of concerns of computer users is central to this exploratory study. The following is an explanation of the procedures that were used in the development of the instrument. As noted in the previous section, these steps closely mirror those followed in previous studies (Barucky, 1984; Hall, George, & Rutherford, 1979; Kolb, 1983).

Questionnaire Construction and Modification Process

The first step, as previously indicated, was to develop an adequate reserve of concern statements regarding computing. There must be a sufficient number of items which represent a broad range of concerns on the questionnaire, so that individuals with varying amounts of computing experience will find choices that are relevant to their circumstance. The data for the concerns statements were obtained in the investigation (Phase I described in the previous section) and, to a much lesser extent, the observation/interview pilot study (Martin, 1987). As in prior concerns studies, the goal

was to collect as great a variety of concerns statements as possible in order to capture examples of the many types of concerns that may exist among computer users.

Therefore, the second step was to identify all of the concerns statements that could be derived from the 222 responses to the open-ended concerns statement instrument. As a result of this procedure, 156 distinct and varied statements of concern about computing were extracted from the responses. Modifications were made to some of the statements after consultation with one of the members of the R&D Center for Teacher Education who participated in the development of the original concerns questionnaire. Many of the changes were structural in nature. For example, items stated in the negative were reworded to be positive. Also, future tense was eliminated because the items were to represent current concerns about computing.

However, the possibility of the existence of another phenomenon relating to the stages of concern began to materialize. A number of the statements collected suggested the possibility that the consequence stage might be comprised of two separate components. One of the components reflected the traditional concerns about the effect the individual had on others. The following are typical of consequence concerns that center on others.

I am concerned about the effect I have on others in their use of computers.

My goal is to provide assistance with computer-related work that is beneficial to the recipient.

In prior SoC studies, consequence concerns also centered on the individual's effect on students, patients, subordinates, or some other person or group of people. As noted, the same type of consequence concerns surfaced in this study but certain related items seemed to imply that another type of consequence might also be present. The following are typical of consequence concerns that center on self rather than others.

Learning how to use computers provides me with many benefits.

It is very rewarding to me when my computer work is successful.

Further substantiation of the possibility of a consequence/self concept surfaced in interviews with experienced computer users. A certain status seems to be accorded "computer people." One student spoke of the way she was perceived by other students on her dormitory floor. She had a certain distinction because of her computing major. She enjoyed being viewed in such high regard. Her body language and tone of voice clearly indicated that she found her status rewarding even though she had to work much harder than some of the other students.

One computing professional reported that he was frequently in demand because of his computing expertise. He

felt that he had a special status because of his occupation. There were many examples of computing expertise enabling the individual to have increased status in relation to others.

Several discussions took place with two of the members of the R&D Center for Teacher Education and with other experienced researchers who had knowledge of this study. The decision was ultimately made to include the consequence/self items in the preliminary questionnaire. The concept is reflected in the composition of the stage definitions. This change and other changes were made to the seven, which became eight, stages of concern in order to reveal the differences uncovered when computing was the focus of concern (see figure 4). This was an evolutionary task which continued throughout the data analysis process.

The third step was to select concerns statements that were to be used in the 78-item preliminary questionnaire. Once the 156 usable statements were determined, they were Q-sorted by five individuals who had varying amounts and types of computing experience and varying amounts of familiarity with the Stages of Concern model. The individuals were asked to sort the statements into the stages of computing concern. An additional category was included which was composed of those items which the sorters could not fit in any other category. Those items that had the highest rate of agreement as to which stage they represented were included in the preliminary computing concerns questionnaire.

0 CONTEXTUAL: Societal issues and "Orwellian" fears. These concerns are not directly related to the individual's use of a computer. They have to do with the use of computers in society. Emphasis is on negative economic impact, influence on children, health, undue dependencies on computers, and deemphasis of the individual and human values.

1 INFORMATIONAL: These concerns suggest an interest in having more information about computers in general or about a specific aspect of computing. Emphasis is on concerns about learning how computers can be used and how they function.

2 PERSONAL: These concerns focus on implications for the individual. There is an uncertainty or anxiety about the demands of computing and the adequacy of his/her ability to meet those demands. Emphasis is on concerns about oneself, personal status, and the opinions others have about them in relation to computing.

3 MANAGEMENT: These concerns focus on time constraints, limited or inadequate instructional material, help resources, data integrity, availability of resources, and the steps required to complete a computing task.

4/S CONSEQUENCE (Self): These concerns focus on the effect the individual's expertise with computers has on himself/herself. Emphasis is on the individual's personal or professional benefits available as a result of having computing know-how.

4/O CONSEQUENCE (Others): These concerns focus on the effect the individual's expertise with computers or a particular aspect of computing has on other people. Emphasis is on concerns about the quality of the computer-related work produced by the individual and its impact on people evaluating or using the output of the effort.

5 COLLABORATION: These concerns relate to coordination and cooperation with others or a particular application of the technology in order to have increased positive effects of use.

6 REFOCUSING: These concerns focus on the extension of the benefits of computer use in a more universal way, including the possibility of major changes and alternatives in the use of the technology. The individual has definite ideas about alternatives to the proposed or existing use of computers or a particular aspect of computing.

Figure 4. Stages of Concern About Computing.

Discussions with several of the individuals who participated in the Q-sort procedure led to further editing and clarification of the statements. Further lengthy consultation was entered into with the member of the R&D Center for Teacher Education. This iteration of the questionnaire was administered to 22 individuals who were asked to critique and offer suggestions about the clarity of the directions of the instrument. Their suggestions were incorporated into the instrument.

Initially there were 76 items on the questionnaire. Later, as a result of a second member of the R&D Center on Teacher Education reviewing the items, other minor modifications were made. This R&D Center member also suggested that additional items that indicated certain types of concerns, and had also elicited substantial agreement by the individuals who had conducted the Q-sort procedure, be included in the instrument. Those changes were made and two additional items were added to the preliminary questionnaire. Additionally the second R&D Center member made several recommendations regarding techniques that could be used in the design of the demographic information page of the questionnaire to improve the chances of obtaining the desired data. One technique that was suggested was to use categories to be checked rather than open-ended questions for such data as age and amount of experience. These suggestions were also incorporated in the product.

Again, a small volunteer sample was administered the questionnaire. Comments about clarity were requested. This sample indicated that the directions and items were generally clear, and although there was some discussion of the instrument, no substantive modifications were required.

Item Placement

Location of the items on the preliminary questionnaire was made by using a table of random numbers (Borg & Gall, 1979). However, a decision was made to shift some items due to the possible effect their placement on the questionnaire might have. For example, "computers have a way of making me feel incompetent" was moved from the first item position to a place later on in the document. Also, when it was discovered that many items representing the same stage of concern were clustered together, some exchange of items placement took place. Even so, most items remained in the position to which they were relegated through the randomization process.

Administration of the 78-Item Questionnaire

The next task was to administer the 78-item preliminary computing concerns questionnaire (see Appendix). The preliminary questionnaire was administered to 323 participants who had varying amounts of computer experience. The amount of experience ranged from none at all to extensive. Each respondent ranked how well an item on the questionnaire reflected his or her feelings about computing according to a seven-point Likert scale. The ranges for each

item were 0 (irrelevant) to 7 (very true of me now), depending on how accurately the item represented the individual's feelings about computing.

Almost all of the subjects were contacted in a group setting. However, some of the subjects were contacted individually and asked to return the questionnaire by mail. Each of the subjects was provided the questionnaire, a demographic information page, and cover sheet with directions. In those cases when the subjects were in a group setting, a brief statement (see Appendix) was given outlining the purpose of the questionnaire, the voluntary and anonymous nature of the instrument, and directions for completing the questionnaire. All of the foregoing information was also included in the cover sheet. Approval for the use of human subjects was granted by the Institutional Review Boards of the participating institutions prior to the administration of the questionnaire. Where students were concerned, classes from various disciplines were chosen for inclusion in the study in order to gain responses from individuals who represented nonusers of computers and representatives of the various categories of computer users: professionals, intermediates, and novices. This stratified convenience sample is identified further in a later section of this chapter.

Analysis of the 78-Item Questionnaire

The next step in Phase II was the factor analysis of responses to the questionnaire. "Factor analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables" (Kim & Mueller, 1978, p. 9). The method used was factor analysis using VARIMAX and rotation procrustes toward the hypothesized structure. The factors in this instance are the hypothesized Stages of Concern of Computer Users (indicated earlier in Figure 4). The desired results of factor analysis is to discover the underlying relationships among the variables so that the original data can be reduced to a smaller set of factors. The data were rotated to see what factors the items loaded on and whether those factors compared with hypothesized stages of prior concerns studies. As a result of this procedure, the four items that loaded highest on each factor in the hypothesized structure were included on the final 32-item version of the questionnaire.

An analysis of the demographic data resulted in further modification of the demographic information page of the questionnaire. All of the background questions with one exception were designed so that the respondent could place a check in the appropriate blank. However, there was such a diversity of responses to the employment question that it was determined that the development of reasonable categories of jobs was impossible. Again, these changes were done in

consultation with an experienced member of the R&D Center for Teacher Education.

Phase III: Discussion of 32-Item Instrument

The form of the final 32-item questionnaire (see Appendix E) that was administered in this exploratory study was similar in construction to its 78-item predecessor. The instrument is comprised of a cover page, with directions for completion of the questionnaire, the questionnaire itself, and a demographic information page. The instrument was completed by 388 subjects. The participant sample was composed of nonusers of computers and individuals with varying amounts of computer experience.

The items on the questionnaire were randomly ordered using a two-stage process. First, the eight stages were randomly ordered. Then the items within the stages were randomly assigned within each of the eight stages using a table of random numbers (Borg & Gall, 1979). This was done so that no two of the same stage items would be adjacent. This resulted in each group containing one item that is representative of each of the eight stages of concerns about the use of computers. The groups of items were then randomly ordered and placed on the pages of the questionnaire. There was some adjustment of items so that statements about consequence/self, consequence/others, and collaboration were dispersed to a greater degree than strict randomization allowed. It was hoped that this would encourage the

respondent to consider each item on its own merits rather than developing a response pattern.

One group of subjects was asked if they would be willing to complete the instrument again three weeks later to ascertain if the responses to the items were consistent over time. They were told to write the last four digits of their telephone number or their social security number on the top of the form if they were willing to complete the instrument again. All but two of the subjects included four digits on their forms. A group of 56 subjects completed the instrument a second time.

Data Analysis

The final step was the analysis of the responses on the final version of the questionnaire. The objectives of the data analysis were to determine whether:

1. computing is an area of change that can be used to test the generalizability of the Stages of Concern framework;
2. an instrument for assessing Stages of Concern among computer users be developed within the framework which is both valid and reliable;
3. there is a relationship between the level of computing education and experience and the sequence of concern stages;
4. there is a relationship between the intensities of various concern stages and the computing application experience level of an individual;

5. there are associations between age/gender and SoC scores;

6. there is an effect when a major system or software change has upon a computer user's concern stage and concern sequence.

In order to respond to these research questions, analysis methods were used that had been effective in prior concerns studies (Barucky, 1984; Hall & George, 1980; Kolb, 1983; Van den Berg & Vandenberghe, 1981). To answer the first two questions, factor analysis with VARIMAX and procrutes rotation toward the hypothesized structure was used to assess the responses of the subjects to the items on the final questionnaire. The factors were then rotated toward the hypothesized Stages of Concern of Computer Users. The resulting factor matrix was examined to ascertain whether a correlation existed between the items which had the highest loadings and the items on the questionnaire previously selected as being representation of the particular hypothesized stage of concern. Ideally, a list of items showing highest VARIMAX loads would reveal four items showing highest loads on each scale. Correlation analysis is used to obtain a measure of the degree of association that exists between two variables (Hamburg, 1974). The Pearson r correlation was used to scrutinize the relationship between the items on the instrument and the raw stage scores. In

addition, Pearson r was also used to explore the relationship among all of the eight raw stage scores. Each item should correlate higher with the other items on the same scale than with items on other scales (George, 1977). This can be determined by correlating each item with the sum of the other items on the scale to which it has been assigned and also with the sum of the other scales. Each item should have a higher correlation with its own scale than any other. In addition, the individual item correlations between items on the same scale should be higher than item correlations between items on different scales. A table was constructed showing these within-scale and between-scale correlations.

These treatments, along with the Q-sort procedure described earlier, are methods that can be used to determine construct validity of an instrument. Construct validity is the extent to which a particular instrument can be used to measure a hypothetical construct (Borg & Gall, 1983).

Further exploration of construct validity was undertaken when an assessment was made to determine if the hypothesized stages of concern are sequentially progressive. In order to carry out this task, data were categorized according to stage of concern and then compared with the amount of experience of the computer user. However, care had to be taken because experience alone is not the key to SoC development.

Content validity, the degree to which the items on the instrument represent the content that the instruments are

designed to measure (Borg & Gall), were demonstrated through the methods used to select the items for the questionnaire.

Attention was also paid to the estimation of reliability of the instrument in terms of degree of consistency among the items on the instrument and the degree of consistency over time. The method used was Cronbach's Coefficient Alpha, a general form of the Kuder-Richardson 20 formula which can be used when items are not scored dichotomously. "Formula 20 is considered by many specialists in educational and psychological measurement to be the most satisfactory method of determining reliability. This formula is being used to an increasing degree to determine the reliability of standardized tests (Borg & Gall, 1983, p. 285). In the case of an instrument with multiple response possibilities where each item and each response is given a different weight, alpha is the appropriate method for computing reliability. The data collected from the test-retest component of Phase III were also used to analyze the degree of consistency of responses over time.

Questions having to do with the sequential pattern of the Stages of Concern, the effect of experience with computer applications, and age/gender considerations, can be addressed using analysis of variance (ANOVA). ANOVA was used to examine differences in mean raw stage scores between groups of people with varying amounts of computer experience to determine if there is a sequential relationship between

predominant Stages of Concern of Computer Users and the amount of computing experience. The sequential nature of concerns are inferred based on the cross-sectional pattern of SoC scores associated with demographic items. Percentile scores were used to compare groups graphically and to explore predominant or peak stage scores. Hall, George, and Rutherford (1979) indicated that the use of percentile scores provide a method for examining the data on a scale of relative intensity.

Additional analysis included a cluster analysis of respondents based on the raw scale scores to investigate predominant patterns of concerns. These groups are described not only using the SoC profile but also by their responses on demographic items.

Question six concerning the effect of change in the computing environment was addressed using the responses to the question about impending change on the demographic page of the questionnaire. The responses were correlated with SoC raw scale scores to see if users with similar age/gender/ experience have different concerns when a change occurs.

Study Population

In the administration of the open-ended statement of concern form, the 78 and 32-item questionnaires, a stratified convenience sample was used in order to gain a representation of individuals in each of the three categories of computer users--professionals, intermediates, and novices as well as

nonusers of computers. An advantage of stratified sampling is that there is representation of the various subgroups of a population (Ary, Jacobs, & Razavieh, 1985). The majority of the representatives of the novice and intermediate categories were obtained from the student populations of two higher education institutions located in the same urban center.

One of the institutions had approximately 2,500 students who tended to be younger and more traditional, while the second institution having approximately 7,000 students had a large number of non-traditional (over 21 years of age) students who were employed and attended classes part-time. Each campus offered multiple sections of a course designed to acquaint the students with basic computing concepts and the three major genres of software: word processing, spreadsheet, and data base. The questionnaire was administered to all students taking this course at both institutions. Most of the students in these sections are novices. Each institution also had students enrolled in courses designed for individuals who are majoring or minoring in one of the computing disciplines. The questionnaire was administered in classes that were most likely to have students who had taken a minimum of three prior computing courses. Additional classes were selected for administration of the questionnaire because those students were likely to have taken a minimum of six prior computing classes. This selection process was carried out in order to obtain a as

great a cross-sampling of the population as possible. Most of the students in these courses were intermediates. In addition, classes of students from outside the computing departments of the institutions were asked to complete the questionnaire in order to gain greater heterogeneity in the sample. For example, nursing, education, business, and several liberal arts classes were included. Some nonusers of computers were in attendance in these classes, as well as those individuals who have learned to use the technology elsewhere.

Students, staff, administrators, and computing professionals from a third higher education institution were included in the sample of those administered the final 32-item questionnaire. This institution has approximately 13,000 students and serves a diverse population. Most of the students who participated were enrolled in classes that utilize computers. The classes ranged from introduction of computing concepts to more advanced and sophisticated computing applications.

Obtaining concerns data from computing professionals occurred using various methods. In one of the institutions, there were many members of the computing profession who took undergraduate and graduate courses. Therefore, data from some representatives of the professional community were collected via the classroom administration. The questionnaire was also administered to a group of computing professionals attending a computing seminar.

Summary

The focus of this chapter has been a description of the procedures followed in the three major phases of this exploratory study. Phase I involved the identification and collection methods used to derive the various computing concern statements to be used in the questionnaire. People with various levels of computing expertise were sampled in order to generate as many distinct items as possible.

Phase II highlighted the modification of items and construction of a 78-item preliminary questionnaire. A description of the many steps involved in the preparation of the instrument itself, the cover sheet, and the demographic page were included. Special emphasis was placed on the Q-sort procedure, placement of items on the questionnaire, administration of the instrument, and the method used for data analysis.

Phase III centered on the administration of the final 32-item questionnaire and the methods used to analyze the data. Validity and reliability issues were also discussed in this chapter. A final section was devoted to a description of the stratified convenience sample used in the study.

CHAPTER IV
FINDINGS

Introduction

The data analysis described in Chapter III was designed to determine whether the Stages of Concern Model is an appropriate framework to assess concerns among computer users; to determine whether a valid and reliable instrument for assessing Stages of Concern among computer users could be developed within the framework; to determine whether the intensities of the concern stages are dependent upon the amount of experience a person has with a specific computer application; to determine whether there is a sequential pattern to the Stages of Concern which can be associated with computing experience or education; to determine if concerns about using computers are associated with age and/or gender of an individual; and to determine what effects a major system or software change has on a computer users's concerns profile.

Because the priorities in this exploratory study were to determine if the Stages of Concern Model is an appropriate conceptual model to assess concerns among computer users and to determine whether a reliable

instrument for assessing the computing concerns could be developed, two separate sets of data were collected through the use of two computing concerns questionnaires. Several analyses were completed for each set of data. First, an analysis of the responses collected through the administration of the 78-item preliminary questionnaire during Phase II of the study was conducted in order to select the best items for the 32-item final questionnaire to be used in Phase III; further, it was necessary to ascertain whether the demographic page of the questionnaire was sufficient to capture the data necessary to address the remaining study questions. The results from this analysis have been reported to show the evolutionary process which culminated in the development of the final instrument.

Second, an analysis of the responses collected through the administration of the 32-item questionnaire was undertaken to corroborate the appropriateness of the items selected for the final questionnaire and to answer the other questions under investigation. The analyses of this last set of data were considerably more comprehensive than the analyses that were undertaken on the data collected using the 78-item questionnaire since the latter results were used to address all of the study questions.

Analysis of Responses to 78-Item Questionnaire

Questionnaire Respondent Demographics

As noted in Chapter III, the sample in Phase II of this study consisted primarily of students at two higher education institutions in the same city. The sampling process yielded a return of 323 usable responses out of 347 questionnaires that were disseminated (approximately 93%). The high rate of return was probably attributable to the personal administration of the questionnaire to a majority of the respondents. The composition of the respondents is reported in several ways in order to describe the diversity of the sample. Having a diverse sample was important because of the nature of the study questions. Approximately 46% or 150 of the respondents were female. There were 172 males. One respondent did not indicate a gender. Although there was a considerable range in the age category, 173 (or almost 56%) respondents were between 20 and 29 years of age. Table 1 shows the complete age distribution. In Tables 2, 3, 4, 5, 6, and 7 the results reported indicate the range and quantity of computer related courses taken and types and duration of software experiences various subjects possessed. In addition to the software reported specifically, 51 respondents (approximately 16%) reported experience with other types of software which ranged from accounting to weapons-control

applications. Slightly more than 8% of the respondents had never taken a computer related course. Approximately 13% had taken one course. Roughly 28% of the sample had received a moderate amount of instruction (two to four courses) and a final group (almost 42%) had been involved in an extensive amount of formal training. An examination of the software experience tables reveals that word processing is by far the most popular application followed by the use of computer games. Over half of the respondents (169 or 52.8%) use a computer on the job and an almost identical number (167 or 52.2%) employ one for personal use.

Table 1

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, Cumulative Percent of Responses Categorized by Six Age Groupings

Age	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Under 20	26	8.0	26	8.0
20 to 29	173	53.6	199	61.6
30 to 39	87	26.9	286	88.5
40 to 49	32	9.9	318	98.5
50 to 59	3	0.9	321	99.4
60 or over	2	0.6	323	100.0

Table 2

78-Item Computing Concerns QuestionnaireFrequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Number of Courses/Seminars/Workshops Taken

Courses	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	27	8.4	27	8.4
One	69	21.4	96	29.7
Two	42	13.0	138	42.7
Three	34	10.5	172	53.3
Four	15	4.6	187	57.9
Five	19	5.9	206	63.8
Six	9	2.8	215	66.6
More than six	108	33.4	323	100.0

Table 3

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Four Levels of Word Processing Experience

Experience	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	36	11.1	36	11.1
Less than 6 mos.	109	33.7	145	44.9
6 to 18 mos.	50	15.5	195	60.4
More than 18 mos.	128	39.6	323	100.0

Table 4

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Four Levels of Spreadsheet Experience

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	102	31.6	102	31.6
Less than 6 mos.	129	39.9	231	71.5
6 to 18 mos.	35	10.8	266	82.4
More than 18 mos.	57	17.6	323	100.0

Table 5

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Four Levels of Database Experience

Experience	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	94	29.1	94	29.1
Less than 6 mos.	122	37.8	216	66.9
6 to 18 mos.	47	14.6	263	81.4
More than 18 mos.	57	17.6	323	100.0

Table 6

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Five Levels of Graphics Experience

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	1		1	
None	137	42.5	137	42.5
Less than 6 mos.	105	32.6	243	75.2
6 to 18 mos.	34	10.6	277	85.7
More than 18 mos.	46	14.3	323	100.0

Table 7

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Five Levels of Game Experience

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	1		1	
None	62	19.3	62	19.3
Less than 6 mos.	81	25.2	144	44.4
6 to 18 mos.	31	9.6	175	54.0
More than 18 mos.	148	46.0	323	100.0

Another indication of computer experience was the ability to program in one or more programming languages (table not included). BASIC was the most popular programming language as evidenced by the 203 respondents (63%) who reported experience with the language. COBOL was the second most popular language (126 or 39% of respondents), followed by Pascal (98 or 30% of respondents). The sample also reported how subjects viewed themselves regarding computing competency experience. A distribution of those responses is provided in Table 8. Clearly most of the respondents considered themselves either novices or intermediates. In Table 9 the amount of time that an individual reported having used a computer is displayed. The data in that table seems to support the data provided in the previous table.

There was also considerable diversity in the occupational backgrounds of the participants. Although many subjects classified themselves as students, many of those were employed as well. A sample of the occupations listed included, accountant, computer operator, programmer, electrologist, financial consultant, housewife, librarian, pharmacy technician, pilot, radiologist, salesman, secretary, teacher, and systems analyst.

Table 8

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Five Levels of Computer Experience

Levels of Experience	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Did not report	3		3	
Nonuser	32	10.0	35	10.0
Novice	106	33.0	141	43.0
Intermediate	125	38.9	266	81.9
Old hand	57	17.8	323	100.0

The last category of demographic data collected explored the frequency, types, and time frame of change in the computing environment. More than half of the respondents (174 or 54%) reported that a change in hardware, software, and/or procedures was currently taking place or would take place soon in their lives.

Table 9

78-Item Computing Concerns Questionnaire Frequency, Percent, Cumulative Frequency, and Cumulative Percent of Responses Categorized by Nine Intervals of Time of Computer Use

Time	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	3		3	
Never used one	15	4.7	1	4.7
0 to 3 mos.	34	10.6	52	15.3
4 to 6 mos.	21	6.6	73	21.9
6 to 12 mos.	13	4.1	86	25.9
1 to 2 years	52	16.3	138	42.2
2 to 5 years	98	30.6	236	72.8
5 to 8 years	48	16.0	284	87.8
More than 8 years	39	12.2	323	100.0

Item Selection for Final Questionnaire

In order to select the items that would be included on the final questionnaire the responses of the 323 subjects on the 78-item instrument were assessed using a variety of statistical techniques, including factor analysis. SAS factor analysis using a VARIMAX rotation followed by a

Procrustes rotation were used in the analysis of the questionnaire responses to aid in the determination of existence of the hypothetical stages of concern. Kim and Mueller (1978) state that one objective of factor analysis is the reduction of a set of variables to a smaller number of hypothetical variables. They also state that factor analysis is a means of assessing data for possible data reduction. Borg and Gall (1983) note that factor analysis is a valuable tool in educational research when interrelationships and commonalities among a particular set of variables are to be explored.

Two rotation methods were used on the data in this phase of the study. The results of each rotation were compared to determine which of the items best represented the concerns of computer users. However, according to Kim and Mueller (1978),

> Our advice to the user is that one should not be unduly concerned about the choice of the particular rotation method. If identification of the basic structuring of variables into theoretically meaningful subdimensions is the primary concern of the researcher, as is often the case in exploratory factor analysis, almost any readily available method of rotation will do the job. Even the issue of whether factors are correlated or not may not make much difference in the exploratory stages of analysis. (p. 50

Information in the SAS User's Guide: Statistics also provides the point of view that statistically all rotation methods are equally good. Further, "If two rotations give

rise to different interpretations, those two interpretations must not be regarded as conflicting. Rather, they are two different ways of looking at the same thing, two different points of view in the common-factor space. Any conclusion that depends on one and only one rotation being correct is invalid (1985, p. 338)".

Although the results of VARIMAX rotation alone were helpful in the analysis process, the addition of the Procrustes rotation method made the data interpretation easier. One outcome of the Procrustes procedure was a factor matrix which lists the factor loadings for each item on each of the factors or hypothesized stages (Table 10). The matrix illustrates which items were most representative of (loaded highest on) each stage (See Appendix D for a listing of items by hypothesized stage). The entries on the table are the factor loadings and express the correlation between the individual items and the factor. Sample size and number of variables being examined are determinants of the significance factor. If the sample size is 50 or more, a factor loading of .30 is considered to be significant at the .01 level. When the sample size is at least 300, a factor loading of .15 is significant at the .01 level. The level for accepting factor loadings as being significant decreases as the number of variables

tested increases (Hair, Anderson, Tatham, & Grablowsky, 1979). If the items loading highest on a factor were predominantly the items selected as representative of the hypothesized stage, then there was additional support that the stages identified correspond to the hypothesized stages of concern.

The entries on Table 10 illustrate that some items load higher on one factor and lower on all others. Those items became candidates for inclusion on the final questionnaire. Item numbers 5, 25, 28, and 49 are examples of items that loaded higher on one factor (stage 0) and lower on all other factors. However, some items, such as 60, were less likely to be included on a subsequent questionnaire because there is too much homogeneity in the loadings, and the item did not relate distinctly to any one stage. Loadings followed by an asterisk indicate a corresponding item selected to represent that stage on the final 32-item questionnaire.

Table 11 consists of the items from the 78-item questionnaire with their highest and second highest loading on each factor. From this table one can ascertain whether those items clustering with each factor (stage) tended to have the highest loadings and whether they load lower on other factors. Also, one can see whether those highest loading items tended to be from the stages as they were

Table 10

78-Item Questionnaire Factor Loadings on Eight Stages of Concern by Seventy Eight Item Numbers

Item	Factor Loadings on Each Stage							
	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4s	Stage 4o	Stage 5	Stage 6
1	3	27	11	- 2	- 2	-13	2	- 7
2	- 4	- 2	-17	11	4	29	15	32
3	- 5	- 6	6	28	31	12	- 7	0
4	- 8	- 3	5	5	-18	2	7	46*
5	55*	- 5	- 1	- 5	-11	-17	2	- 3
6	- 1	-11	23	19	2	-14	-20	28
7	- 3	37	23	-12	2	-15	- 3	- 1
8	- 5	- 4	10	28	43*	21	2	-12
9	- 7	33	- 3	2	12	9	0	10
10	- 8	19	- 1	29	40*	22	- 8	- 7
11	- 1	- 1	51	- 3	-10	-23	-14	5
12	- 4	11	47	18	23	2	-11	-10
13	27	4	9	-19	-10	- 2	2	- 5
14	- 4	7	- 8	20	- 2	17	-15	43
15	38	2	- 3	-16	-12	- 2	16	10
16	-14	51*	7	- 4	9	- 5	- 6	5
17	3	6	- 9	7	- 2	- 2	7	33
18	28	0	18	- 4	-13	- 4	3	22
19	- 9	- 2	-12	40	27	36	-11	13
20	-14	1	8	- 3	-23	- 2	14	53*
21	- 7	27	5	- 6	2	18	16	16
22	- 9	11	52	-16	- 8	2	0	5
23	1	2	11	12	22	34	10	- 4
24	-13	10	40	2	10	3	10	2
25	58*	- 8	3	- 2	- 4	-13	8	- 4
26	- 3	- 1	59*	- 4	8	- 9	14	- 8
27	- 1	-14	- 5	- 3	- 8	19*	29	38
28	53*	- 5	- 6	- 4	- 2	- 1	9	- 3
29	- 2	-10	12	30	45*	26	20	-13
30	53	0	- 2	12	- 2	- 1	9	- 3
31	12	- 1	- 8	46*	36	25	-14	6
32	- 2	10	-15	18	9	39*	9	25
33	0	3	- 7	17	27	39	15	3
34	12	26	- 5	7	6	11	12	9
35	2	- 3	53*	12	7	-27	-10	- 7
36	3	4	29	16	20	-19	2	- 2
37	4	- 7	44	26	17	-25	- 8	- 2
38	7	1	22	5	- 4	-16	6	27

Table 10--Continued

Item	Factor Loadings on Each Stage							
	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4s	Stage 4o	Stage 5	Stage 6
39	- 3	8	- 2	4	5	14	29	20
40	41	7	- 7	10	16	7	- 5	- 8
41	1	- 9	- 7	3	-13	23	25	43*
42	- 3	56*	2	-20	-15	4	14	6
43	- 7	- 9	- 5	10	-11	32*	15	42
44	- 4	- 5	7	35*	20	31	0	17
45	7	- 3	-10	4	-12	12	26	40
46	5	- 2	53	9	3	- 4	2	- 7
47	- 4	- 7	35	- 2	11	38	24	- 6
48	- 5	49	- 1	- 5	13	17	15	-11
49	61*	4	- 5	7	- 8	5	0	- 4
50	30	6	- 4	24	4	20	- 6	9
51	- 1	0	- 5	4	-16	19	21	47*
52	2	1	- 3	- 1	10	23	39*	15
53	- 2	- 8	37	4	12	42	26	- 9
54	- 3	0	- 1	- 2	0	17	36*	27
55	3	- 6	6	31	48*	27	16	-16
56	8	- 4	14	42*	38	18	2	-11
57	12	48	- 6	8	1	19	- 4	- 4
58	9	5	-11	10	10	34	28	15
59	- 1	42*	3	7	6	- 9	0	3
60	- 4	22	19	3	-23	- 1	- 9	0
61	3	- 4	- 6	7	- 1	3	37	24
62	- 3	- 1	- 3	16	21	15	32	9
63	17	7	18	21	15	29	- 2	- 3
64	3	- 6	0	10	13	37*	33	7
65	4	23	7	5	- 7	-16	2	2
66	4	4	-11	8	6	2	31	16
67	4	6	- 4	13	28	18	24	- 2
68	- 3	- 4	11	18	36	10	19	- 6
69	- 3	- 2	0	- 3	3	22	39	19
70	14	15	33	- 2	-24	- 4	-10	5
71	3	-10	42	11	- 7	- 6	- 2	12
72	- 1	2	52*	18	- 1	-17	- 9	2
73	5	- 7	11	28*	5	17	- 4	23
74	- 2	55*	0	- 9	-20	16	6	8
75	- 5	30	8	- 5	15	8	24	1
76	- 3	13	5	- 3	9	15	37*	10
77	37	0	- 4	18	8	23	- 9	- 2
78	8	- 3	- 5	2	7	25	43*	14

hypothesized. If these conditions were present, there was an indication that eight somewhat independent factors did exist, and that they corresponded to the proposed stages. A look at Table 11 reveals that all of the items had loadings well above .15. In fact, 70 of the 78 items (approximately 90%) had loadings above .30. With the exception of stage 4o all of the eight factors identified are comprised primarily of items representing a single stage. In stage 0 for example, all ten of the items originally projected as stage 0 items were identified as stage 0 items. However, even in stage 4o there are more projected 4o items than any other items. A total of 51 of the 78 items (65%) loaded highest on the hypothesized factor.

According to Kim and Mueller (1978), "the most commonly used procedure for determining the number of initial factors to be extracted is a rule-of-thumb--the rule known as the Kaiser or eigenvalue criterion (eigenvalue greater than or equal to 1)" (p. 49). In this case, there were seven eigenvalues greater than 1 and the eighth was .96, making eight a reasonable number of factors.

Table 11

Results From 78-Item Questionnaire: Numbers Loading Highest, Highest Loading Value, Next Highest Loading Value, and Hypothesized Stage by Eight Stages Of Concern

Items Loading Highest	Highest Loading	Second Highest Loading	Hypothesized Stage
	Factor Associated With Stage 0		
49	.61	.07	0
25	.58	.08	0
5	.55	.02	0
28	.53	.09	0
30	.53	.12	0
40	.41	.16	0
15	.38	.16	0
77	.37	.23	0
50	.30	.20	0
18	.28	.22	3
13	.27	.09	0
	Factor Associated With Stage 1		
42	.56	.14	1
74	.55	.16	1
16	.51	.09	1
48	.49	.17	1
57	.48	.19	1
59	.42	.07	1
7	.37	.23	1
9	.33	.12	5
75	.30	.24	4s
1	.27	.11	1
21	.27	.18	5
34	.26	.12	1
65	.23	.07	1

Table 11--Continued

Items Loading Highest	Highest Loading	Second Highest Loading	Hypothesized Stage
	Factor Associated With Stage 2		
26	.59	.14	2
35	.53	.12	2
46	.53	.09	2
22	.52	.11	2
72	.52	.18	2
11	.51	.05	2
12	.47	.23	2
37	.44	.26	3
71	.42	.12	3
24	.40	.10	3
70	.33	.15	2
36	.29	.20	3
	Factor Associated With Stage 3		
31	.46	.36	3
56	.42	.38	3
19	.40	.36	4s
44	.35	.31	3
73	.28	.23	3
	Factor Associated With Stage 4s (self)		
55	.48	.31	4s
29	.45	.30	4s
8	.43	.28	4s
10	.40	.29	4s
68	.36	.19	3
3	.31	.28	4o
67	.28	.24	4o
60	.23	.22	2

Table 11--Continued

Items Loading Highest	Highest Loading	Second Highest Loading	Hypothesized Stage
	Factor Associated With Stage 4o (others)		
53	.42	.26	2
32	.39	.25	4o
33	.39	.27	4o
47	.38	.24	2
64	.37	.33	4o
23	.34	.22	4s
58	.34	.28	5
63	.29	.21	2
	Factor Associated With Stage 5		
78	.43	.25	5
52	.39	.23	5
69	.39	.22	5
61	.37	.24	6
76	.37	.15	5
54	.36	.27	5
62	.32	.21	4s
66	.31	.16	6
39	.29	.20	6
	Factor Associated With Stage 6		
20	.53	.14	6
51	.47	.21	6
4	.46	.07	6
14	.43	.20	6
41	.43	.25	6
43	.42	.32	4o
45	.40	.26	6
27	.38	.29	4o
17	.33	.07	6
2	.32	.29	5
6	.28	.23	3
38	.27	.22	5

The consistency or "internal reliability" of the scale scores representing each stage on the instrument was assessed using SPSS program, RELIABILITY. The formula is a generalization of the Kuder-Richardson Formula 20 for dichotomous items. The "corrected item-total correlation" and "total scale alpha if item deleted" for each item are indicated in Table 12. Also included are the total alpha coefficients of internal consistency for each of the eight hypothesized stages. The corrected item-total correlation is important, because if the correlation is high, there is an indication that the item fits the scale well. When examining the values of "total scale alpha if an item is deleted", one is interested in the items with the lowest values; those items should be included to maintain a high total scale alpha. Item number five, for example, has a "total scale alpha if item deleted" value of .7536 which means that if the item was deleted the total scale alpha for Stage 0 would drop from .7785 to .7536. The total scale alphas are generally higher for scales with more items. With five item scales the alpha should be .60 or better, based on previous concerns questionnaires (George, A., personal communication). The items with asterisks were selected to represent their corresponding stage on the 32-item questionnaire.

Table 12

Reliability Analysis from 78-Item Questionnaire Stage of Concern, Corrected Item-Total Correlation, Total Scale Alpha if Item Deleted, and Total Scale Alpha by Seventy Eight Items

Item	Stage	Corrected Item-Total Correlation	Total Scale Alpha If Item Deleted	Total Scale Alpha
5*	0	.5150	.7536	
13	0	.2830	.7767	
15	0	.3651	.7716	
25*	0	.5590	.7459	
28*	0	.4936	.7541	
30	0	.5202	.7504	
40	0	.4051	.7673	
49*	0	.6449	.7373	
50	0	.3606	.7725	
77	0	.4122	.7658	.7785
1	1	.3544	.8291	
7	1	.4684	.8137	
16*	1	.5852	.8027	
34	1	.4708	.8133	
42*	1	.6523	.7940	
48	1	.5823	.8041	
57	1	.5277	.8076	
59*	1	.5931	.8011	
65	1	.3361	.8262	
74*	1	.5990	.8022	.8252
11	2	.4538	.8022	
12	2	.5469	.7928	
22	2	.4917	.7985	
26*	2	.6015	.7882	
35*	2	.5302	.7946	
46*	2	.6165	.7875	
47	2	.2870	.8169	
53	2	.3515	.8109	
60	2	.2538	.8172	
63	2	.3858	.8076	
70	2	.4503	.8020	
72*	2	.6089	.7869	.8144
6	3	.3741	.7727	
18	3	.3583	.7740	
24	3	.4350	.7663	
31*	3	.4855	.7600	
36	3	.4320	.7667	

Table 12--Continued

Item	Stage	Corrected Item-Total Correlation	Total Scale Alpha If Item Deleted	Total Scale Alpha
37	3	.4100	.7689	
44*	3	.5280	.7551	
56*	3	.5211	.7555	
68	3	.4408	.7655	
71	3	.3384	.7758	
73*	3	.4547	.7637	.7827
10*	4s	.6389	.8324	
19	4s	.5232	.8503	
23	4s	.4996	.8520	
29*	4s	.7059	.8219	
55*	4s	.6985	.8228	
62	4s	.6784	.8255	
75	4s	.6148	.8348	.8547
3	4o	.4008	.8599	
8*	4s	.5212	.8481	
27*	4o	.6287	.8357	
32*	4o	.6772	.8299	
33	4o	.6986	.8275	
43*	4o	.5997	.8392	
64*	4o	.6598	.8316	
67	4o	.6090	.8380	.8564
2	5	.6758	.9100	
9	5	.5477	.9168	
21	5	.6848	.9095	
38	5	.3461	.9259	
52*	5	.8215	.9012	
54*	5	.7766	.9042	
58	5	.7496	.9059	
69	5	.7248	.9071	
76*	5	.7898	.9032	
78*	5	.7846	.9034	.9174
4*	6	.4983	.8768	
14	6	.5612	.8723	
17	6	.5472	.8732	
20*	6	.6737	.8639	
39	6	.6626	.8648	
41*	6	.6861	.8631	
45	6	.6416	.8663	
51*	6	.7109	.8608	
61	6	.5588	.8724	
66	6	.5353	.8741	.8804

The corrected item total for all of the items is relatively high. Only four of the items' values are below .50, and 65% were 60% or greater. However, of particular note is the level of the total scale alpha. All of the stages had high alphas. The alphas exceeded those generated in the prior stages of concern questionnaire development research. Of the eight stages, six of the alphas were above .80 and the alpha for stage five was .9174. The high alpha levels were a major consideration in the decision to use four items per stage. The use of four items was deemed particularly beneficial because eight stages were to be represented on the final questionnaire. Fewer items also helps to reduce intercorrelations between scales.

A composite of the results of four different item analysis methods that were conducted are displayed in Table 13. The table was developed to help in the item selection process. Initially all 78 items were assessed during the analysis process. However, an initial screening reduced the number to five, six, or seven representative items from each stage based on the number of items that appeared promising. Table 13 represents a summary of the findings. Included in the table are the items for each scale along with their corresponding stage. This was followed by a ranking for each of the analysis measures used. Each item

received a rank based upon how the item measured with respect to each of the procedures. For example, item 5, a representative of stage 0, ranked fourth when total scale alpha if item deleted, Pearson Correlation, and VARIMAX rotation were used, and third when Procrustes rotation was used. Item 16, a representative of stage 1, ranked fourth when Total Scale Alpha if deleted and Pearson correlation were used, first when VARIMAX rotation was used, and third when Procrustes rotation was used. As noted earlier in this chapter, a variety of techniques can be helpful in the interpretation of data. The use of a variety of techniques was particularly helpful when a few of the candidate items for selection were not as clear as one would like them to be. In cases such as stages 3, 5 and 6, when VARIMAX rotation was not as supportive of the selection of items as the other procedures, subjecting the data to Procrustes rotation presented another way of looking at the data. However, in a majority of the instances the results of all four procedures were compatible.

Assessing the content of the items became an additional important procedure in the final determination of the items selected for the 32-item questionnaire. For instance, item 43 was chosen for stage 4o, even though it did not rank in the top six items when Pearson correlation

Table 13

Items From 78-Item Questionnaire Selected For Possible Inclusion in Final 32-Item Questionnaire Ranked Across Four Factor Analysis Procedures

Item	Stage	Total Scale Alpha If Item Deleted	Pearson Correlation	VARIMAX Rotation	Procrustes Rotation
*5	0	4	4	4	3
*25	0	2	2	2	2
*28	0	5	5	5	4T
30	0	3	3	3	4T
*49	0	1	1	1	1
77	0	6	6	**	**
7	1	8	7	5	**
*16	1	4	4	1	3
*42	1	1	1	2	1
48	1	5	3	3	4
57	1	6	6	**	5
*59	1	3	5	4	*
*74	1	2	2	2	2
12	2	4	3T	**	**
22	2	6	7	**	4
*26	2	3	2	4	1
*35	2	5	3T	2	2
*46	2	2	3T	3	3
*72	2	1	1	1	5
*31	3	3	2	2	1
*44	3	1	1	**	4
*56	3	2	3	**	2
68	3	5	5	**	**
*73	3	4	4	**	5
*8	4s	3***	3	3	3
*10	4s	4	4	4	4
*29	4s	1	1	2	2
*55	4s	2	2	1	1
*27	4o	4	*	2	*
*32	4o	2	1	3	2
33	4o	1	2	**	3
*43	4o	6	*	1	*

***This item was originally intended for scale 4o; a better fit was found to be scale 4s.

Table 13--Continued

Item	Stage	Total Scale Alpha If Item Deleted	Pearson Correlation	VARIMAX Rotation	Procrustes Rotation
*64	4o	3	3	4	5
*52	5	1	2	**	2
*54	5	4	4	**	6
58	5	5	5T	**	**
69	5	6	5T	**	3
*76	5	2	3	**	5
*78	5	3	1	**	1
*4	6	8	*	**	3
*20	6	3	3T	**	1
39	6	4	**	**	**
*41	6	2	2	**	5
45	6	5	3T	**	**
*51	6	1	1	**	2

* Items selected for final 32-item questionnaire
** Item was not ranked within the first 5 items when using this procedure
T Items tied with others using the procedure

and Procrustes rotation were used, because the content exemplified the intent of the stage definition. A few items with higher or more discriminatory loadings than others on the same scale were not selected if a determination was made that the item content was too much like other selected items in that the items closely expressed the same concern.

In summary, the 32 items chosen for the final questionnaire seemed to most clearly differentiate among each stage. They also seemed to represent a broad spectrum of concerns among individuals with varying amounts of computer experience.

Analysis of Responses to Final 32-Item Questionnaire

Questionnaire Respondent Demographics

As described in Chapter III, the sample in Phase III was similar to the one in Phase II of this study with one exception. Students, staff, administrators, and computing professionals from an additional higher education institution were included in the administration of the final instrument. The idea was to capture an even broader range of respondents. The sampling process yielded a return of 388 responses out of 400 questionnaires that were disseminated (97%). Again, the high rate of return can probably be attributed to the researcher's personal administration of the questionnaire to a majority of the sample. As in the case of the 78-item questionnaire, the composition of the sample is reported in several ways in order to assess the diversity of the sample. The diversity is critical due to the nature of the study questions. Approximately 46% or 180 of the respondents were male.

There were 208 (54%) females. Although there was considerable variety in the age category, a majority (69%) of the sample was between 20 to 39 years of age. Of the remaining respondents, 70 or 20% were over 39 years old. Table 14 shows the complete age distribution. Tables 15, 16, 17, 18, 19, and 20 are useful in the determination of the number of computer courses taken and types and duration of software experience that the respondents possessed. Almost 13% of the sample had no computing coursework experience; 10% of the respondents had taken one course; an additional 36% had a moderate number of courses (two, three, or four); and the remaining respondents (28%) had an extensive amount of coursework experience (five or more courses).

A review of the software experience tables reveals that, as with the Phase II sample, the most used software (85% of the respondents had some experience) was word processing which was used both on the job (40%) and for personal use (64%). Games were the next most used software. Almost 71% of the respondents reported having some experience with games. Approximately one-third (33%) of the sample that used spreadsheets did so on the job. Almost the same percent (32%) also used the spreadsheet software for personal tasks. Database software was not reported as being used as extensively for personal use

(25%) but 37% of the respondents reported the use of that software on the job. More respondents (28%) claim to have used graphics software for personal use than on the job (17%). In addition, approximately 39% of them reported experience with a variety of other types of software.

Table 14

By Age Distribution of Subjects Taking the 32-Item Questionnaire

Age	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	1	0.3	1	0.3
Under 20	49	12.6	50	12.9
20 to 29	164	42.3	214	55.5
30 to 39	104	26.8	318	82.0
40 to 49	51	13.1	369	95.1
50 to 59	18	4.6	387	99.7
60 or over	1	0.3	388	100.0

Table 15

Distribution by Number of Computer Courses Taken by Subjects Completing the 32-Item Questionnaire

Courses	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Did not report	1	0.3	1	0.3
None	50	12.9	51	13.1
One	89	22.9	140	36.1
Two	64	16.5	204	52.6
Three	50	12.9	254	65.5
Four	25	6.4	279	71.9
Five	17	4.4	296	76.3
Six	2	0.5	298	76.8
More than six	90	23.2	388	100.0

Table 16

Distribution by Amount of Word Processing Experience Taken by Subjects Completing the 32-Item Questionnaire

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	57	14.7	57	14.7
Less than 6 mos.	156	40.2	213	54.9
6 to 18 mos.	33	8.5	246	63.4
More than 18 mos.	142	36.6	388	100.0

Total who use word processing:	On the job	Personal
	157 (40%)	247 (64%)

Table 17

Distribution by Amount of Spreadsheet Experience Taken by Subjects Completing the 32-Item Questionnaire

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	140	36.1	140	36.1
Less than 6 mos.	153	39.4	293	75.5
6 to 18 mos.	24	6.2	317	81.7
More than 18 mos.	71	18.3	388	100.0

Total who use spreadsheets:	On the job	Personal
	127 (33%)	123 (32%)

Table 18

Distribution by Amount of Data Base Experience
Taken by Subjects Completing the 32-Item Questionnaire

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	180	46.4	180	46.4
Less than 6 mos.	110	28.4	290	74.7
6 to 18 mos.	23	5.9	313	80.7
More than 18 mos.	75	19.3	388	100.0

Total who use database:	On the job	Personal
	144 (37%)	95 (25%)

Table 19

Distribution by Amount of Graphics Experience
Taken by Subjects Completing the 32-Item Questionnaire

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	202	52.1	202	52.1
Less than 6 mos.	119	30.7	321	82.7
6 to 18 mos.	21	5.4	342	85.1
More than 18 mos.	46	11.9	388	100.0

Total who use graphics:	On the job	Personal
	64 (17%)	108 (28%)

Table 20

Distribution by Amount of Game Experience Taken by Subjects Completing the 32-Item Questionnaire

Experience	Frequency	Cumulative Percent	Cumulative Frequency	Percent
None	113	29.1	113	29.1
Less than 6 mos.	97	25.0	210	54.1
6 to 18 mos.	27	7.0	237	61.1
More than 18 mos.	151	38.9	388	100.0

Total who play games/entertainment:	On the job	Personal
	40 (10%)	240 (62%)

Another indication of computer experience was the ability of subjects to program in one or more computing languages. As with the sample in the preceding phase of this study, BASIC was the most popular programming language as evidenced by 189 respondents (49%) who reported experience with that language. Experience in COBOL and/or Fortran was the second most frequent category of programming experience reported (110 or 28% of respondents) followed by Pascal and/or C (69 or 18% of respondents). The sample also reported on how they viewed themselves regarding computing competency experience. A breakdown of those responses is provided in Table 21. Even with so much

reported experience many of the respondents consider themselves to be novices in the use of a computer (40%). Table 22 displays the actual amount of time that subjects used a computer. As was true with the sample in the prior phase, the data in Table 22 seemed to support the data provided in Table 21.

Table 21

By Computer Experience Distribution of Subjects Taking the 32-Item Questionnaire

Label	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	7	1.8	7	1.8
Nonuser	49	12.6	56	14.4
Novice	156	40.2	212	54.6
Intermediate	129	33.2	341	87.9
Old hand	89	22.9	388	100.0

Table 22

By Time of Computer Use Distribution of Subjects Taking the 32-Item Questionnaire

Time	Frequency	Cumulative Percent	Cumulative Frequency	Percent
Did not report	8	2.1	8	2.1
Never used one	23	5.9	31	8.0
0 to 3 mos.	53	13.7	84	21.6
More than 3 mos.	24	6.2	108	27.8
More than 6 mos.	28	7.2	136	35.1
More than 1 year	86	22.2	222	57.2
More than 3 years	77	19.8	299	77.1
More than 5 years	89	22.9	388	100.0

There was also a considerable diversity in the occupational backgrounds of the participants. Even though many of the respondents were students, many in that category were employed as well. A sample of the occupations listed included aviation administrator, communications specialist, dentist, legal secretary, nurse, systems analyst, educator, seamstress, physical therapist, plumber, and photographer.

The last category of demographic data collected explored the frequency, types, and time frame of change in

the computing environment. Approximately 27% (104 respondents) in the sample were presently or soon to be involved in a hardware change, 38% (118 respondents) in a software change, 17% (66 respondents) in a programming language change, 26% (99 respondents) in a job change, and 27% (103 respondents) in a procedures change.

Results Pertaining to Question 1

Do identifiable "stages (factors) of concern" about the development of computing expertise exist among individuals with varying amounts of computing experience?

This question was addressed by subjecting the responses of the sample to the 32-item Computing Concerns questionnaire to factor analysis with VARIMAX rotation and also rotation toward the hypothesized structure using Procrustes as in Phase II reported earlier in this chapter. The theoretical rotation targets were chosen based upon the stage assignment each item received in Phase II of this study. The factor matrix which resulted from this analysis is presented in Table 23. Items loading highest on a factor were of a significant level if the value was .327 or above. Values with asterisks indicate that the corresponding item was selected to represent that stage on the 32-Item Questionnaire. The results reported in Table 24 are helpful in assessing how well an item, predicted to

be representative of a particular stage, was supported by the factor loadings. SoC 0, 1, and 2 were very clearly supported. SoC 3 is identifiable; SoC 4o item number 5 had nearly equal loadings on SoC 3, 4o, and 5. Also, SoC 6 item number 2 had nearly equal loadings on SoC 3, 4o, and 6. SoC 4s, 5, and 6 were also clearly identifiable. SoC 4o was the most difficult stage to capture; the 4o items were scattered among the stages 3, 4s, and 5 items. There appeared to be evidence that this analysis supported at least six factors.

In order to see if experience in the use of computers made a difference in the "clustering" of items two additional VARIMAX analyses were done. Using four of the experience items from the demographic part of the questionnaire, the respondents were divided into groups based on their maximum response. Those with a maximum response of one (i.e. little uses of any software) were selected for the "low" group, and those with a maximum response of three (use of a variety of software) for the "high" group. The low group analysis seemed to support eight or nine factors as evidenced by the eigenvalues,

Table 23

32-Item Questionnaire Factor Loadings on Eight Stages of Concern by Thirty two Item Numbers

Item	Factor Loadings on Each Stage							
	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4s	Stage 4o	Stage 5	Stage 6
1	-12	12	28	40	56*	44	14	- 5
2	3	22	16	35	14	37	12	37*
3	27	11	59*	8	- 7	- 4	-31	- 9
4	75*	- 1	21	- 9	-23	-11	-25	-10
5	-10	10	-12	50	17	47*	44	26
6	1	70*	24	26	11	21	13	7
7	- 2	41	10	47	34	40	51*	26
8	22	16	65*	4	8	0	-25	-16
9	-13	22	-16	32	21	46*	49	44
10	- 8	74*	7	34	24	16	34	25
11	- 6	16	12	28	56*	15	27	16
12	4	30	22	50*	44	21	28	10
13	7	27	60*	30	46	38	3	-13
14	80*	6	25	6	- 7	- 2	0	2
15	-12	14	21	34	66*	33	32	14
16	6	29	25	73*	36	55	31	19
17	0	30	11	38	19	42	28	53*
18	-17	26	-22	47	25	37*	64	54
19	-11	28	-16	48	33	35	76*	44
20	12	64*	13	35	14	24	38	27
21	82*	6	23	- 2	- 5	- 5	- 8	0
22	9	34	44	45*	46	36	9	7
23	-19	38	3	37	58*	17	32	27
24	-17	44	-15	46	31	34	64*	46
25	- 5	24	-19	42	24	31	64	62*
26	25	44	67*	13	30	5	- 5	3
27	- 3	26	10	45	45	37	60*	36
28	8	9	-17	38*	21	- 3	48	45
29	- 5	19	-21	30	31	7	63	75*
30	12	68*	23	8	40	- 3	17	27
31	- 9	19	- 6	29	43	39*	43	39
32	41*	4	5	15	-12	- 2	3	6

Values with `asterisks' indicate that the corresponding item was selected to represent that stage on the final 32-item questionnaire.

Table 24

Results From 32-Item Questionnaire: Numbers Loading Highest, Highest Loading Value, Next Highest Loading Value, and Hypothesized Stage by Eight Stages of Concern

Items Loading Highest	Highest Loading	Second Highest Loading	Hypothesized Stage
	Factor Associated with Stage 0		
21	.82	.23	0
14	.80	.25	0
4	.75	.25	0
32	.41	.15	0
	Factor Associated with Stage 1		
10	.74	.34	1
6	.70	.26	1
30	.68	.40	1
20	.64	.38	1
	Factor Associated with Stage 2		
26	.67	.44	2
8	.65	.22	2
13	.60	.46	2
3	.59	.27	2
	Factor Associated with Stage 3		
16	.73	.55	3
5	.50	.47	4o
12	.50	.44	3
	Factor Associated with Stage 4s		
15	.66	.33	4s
23	.58	.38	4s
1	.56	.44	4s
11	.56	.27	4s
22	.46	.45	3
31	.43	.43	4o

Table 24--Continued

Items Loading Highest	Highest Loading	Second Highest Loading	Hypothesized Stage
	Factor Associated with Stage 5		
19	.76	.48	5
24	.64	.46	5
18	.64	.54	4o
25	.64	.62	6
27	.60	.45	5
7	.51	.47	5
9	.49	.46	4o
28	.48	.45	3
	Factor Associated with Stage 6		
29	.75	.63	6
17	.53	.42	6
2	.37	.37	6

while the high experience group analysis supports seven or eight factors. Factor one for the high experience group contains SoC 4o, 5, and 6 items, and while the same factor for the low group contains items from these same scales, the SoC 5 items are much less clearly associated with this factor. SoC 5 does not seem to constitute a separate concept for the low group, as the items were split between low loadings on the impact factor and the SoC 3 factor; the SoC 5 items are not associated with 4o and 6 as in the high

group. SoC 0, 1, and 2 seem reasonably clear in both groups SoC 3 is fairly clear in both groups, but SoC 2 item number 13 is seen as a task concern by the low group and an impact-self (4s) concern by the high group. SoC 6 has items distinguishable from the global impact factor only within the high experience group, which is actually very encouraging as support for this factor, as only experienced users would be expected to differentiate these concerns from others.

Results Pertaining to Question 2

Can an instrument for assessing Stages of Concern among computer users be developed within the framework which is both reliable and valid?

Reliability of the Computing Concerns Questionnaire. One gauge of the Computing Concerns questionnaire's internal reliability among items was the use of Cronbach's Alpha coefficient on the items in each scale. These coefficients reflect the degree of reliability among items on a scale in terms of overlapping variance. The alpha coefficients for the eight stages using the final 32-item questionnaire are presented in Table 25.

A second test of the questionnaire's reliability was the stability of the responses over time which was determined by the use of the test-retest procedure. A sub-sample (N=56) of the 388 respondents was asked to complete

the questionnaire a second time 21 days after the first administration. Pearson correlations were computed to ascertain the degree to which the responses remained the same from one administration of the instrument to the next. In Table 26 the correlation coefficients for each stage based on responses to the 32-item final questionnaire are indicated.

Table 25

Alpha Coefficients For Stages of Concerns, N=388 From 32-Item Questionnaire

	SoC Stage							
	0	1	2	3	4s	4o	5	6
Alphas	.78	.78	.73	.65	.71	.78	.83	.76

Table 26

Test-Retest Correlations for Stages of Concerns, N=388 From 32-Item Questionnaire (Pearson-r Coefficient)

	Soc Stage							
	0	1	2	3	4s	4o	5	6
Pearson-r Coefficient	.78	.75	.84	.66	.72	.77	.74	.79

Validity of the Computing Concerns Questionnaire. The validity of the Computing Concerns Questionnaire could not be demonstrated readily. Since no single criterion measure exists by which to test the criterion validity of the questionnaire other determinants of validity were used. Evidence of content validity was present based upon the item selection process that was undertaken in Phase I and II of the study. In Phase I the 222 respondents replied to the question "When you think about using a computer, what are you concerned about?" As a result of the analysis procedure 156 distinct and varied statements of concern about computing were extracted from the responses. In Phase II the statements were Q-sorted by five individuals with varying amounts and types of computing experience and varying amounts of experience with the Stages of Concern Model. The items with the highest agreement were included in the 78-item preliminary computing concerns questionnaire that was administered to 323 participants. Factor analysis (as described earlier in this chapter) was used to determine which items were to be included in the 32-item final questionnaire. Thus, these items were clearly related to concerns about computing.

Construct validity is concerned with how well an instrument measures a construct such as anxiety, intelligence, attitudes, or other behavior pattern (Ary,

Jacobs, and Razavieh; 1985). Construct validity, in keeping with prior concerns based research, would be supported by the identification of independent constructs and by the use of a correlation matrix which shows how the scales (stage measurements) intercorrelate. The factor analysis results reported previously in addressing the first research question, have already, in a substantial way, addressed the question of independent constructs. Guttman used the term simplex to describe a matrix where the correlations near the diagonal are higher than those more removed from it. Guttman scales must be unidimensional in that the component items must measure movement away from or toward an underlying object and the scales must be cumulative (Nie, Bent, & Hull; 1970). The simplex pattern in the interstage correlation matrix would be evidence of a hierarchical order among the stages such that each stage will be more like a stage immediately beside it than like any other stage farther away on the diagonal. If this pattern is visible then a developmental sequence consistent with "early" (Stages 0, 1, or 2) and "later" (Stages 4, 5, or 6) stages of concern similar to that found in prior concerns studies would seem to exist.

The results demonstrating how the scales intercorrelate based upon the data collected in the administration of the

32-item questionnaire are reported in Table 27. A perusal of the coefficients indicates that the simplex pattern does exist in a general but certainly imperfect manner. For example, responses to Stage 2 items are clearly more similar to responses to Stage 3 items than to responses to items found in Stages 4s, 4o, 5, or 6. Similarly Stage 6 responses are definitely more like Stage 5 responses than those found in Stage 0, 1, or 2.

Table 27

Intercorrelation of the 32-Item Computing Concerns Questionnaire Scale Scores Across Eight Stages of Concern

		SoC Stages							
		0	1	2	3	4s	4o	5	6
SoC Stages	0		.07	.23	.08	.18	.13	.08	.01
	1			.29	.36	.26	.29	.45	.33
	2				.27	.22	.16	.02	.02
	3					.56	.44	.55	.48
	4s						.43	.71	.69
	4o							.50	.32
	5								.61

Further, construct validity of the questionnaire would be supported by demonstrating a relationship between computing experience and the hypothesized concerns stages as demonstrated in prior concerns studies. In prior concerns research, respondents with less experience tended to have higher early concerns than more experienced users; and experienced respondents tended to express more intense concerns among later stages. The substantiation of a similar connection between computing concerns stage scores and amount of computing experience would provide additional evidence that the constructs measured behave similarly to the theoretical assumption of concerns theory. Thus, further verification of the construct validity of the instrument would be attained. That relationship is directly related to research question four of this study and will be addressed in a comprehensive manner when that question is reported.

Results Pertaining to Question 3

What is the relationship of the level of computing education and experience to the sequence of concern stages?

The analysis undertaken to address this question began by dividing the respondents into seven groups based upon number of computer courses taken. The mean raw stage scores for each group categorized by number of courses taken (0,1,2,3,4,5, or 6+) is presented in Table 28.

These raw scores were converted to percentiles which were then plotted against concerns stages (for each possible (0 through 6+) number of courses taken. See Figure 1.

Table 28

Comparison of Stage Score Means of Subjects at Eight Stages of Concern by Number of Courses Taken

Number of Courses Taken		SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc 6
0	none N=49	11.76	17.27	15.12	11.41	16.22	6.29	8.84	7.82
1	one N=89	10.52	18.03	17.46	15.78	22.25	8.88	12.99	9.70
2	two N=64	10.22	18.14	16.34	14.34	22.47	9.97	13.78	10.22
3	three N=50	9.46	18.74	14.98	14.22	22.76	10.54	14.34	10.66
4	four N=25	7.12	16.36	13.84	15.08	24.12	13.68	15.00	12.08
5	five N=17	8.65	20.00	13.94	19.29	24.35	14.59	16.35	14.12
6	six+ N=92	7.21	16.08	9.89	16.22	23.75	18.66	18.99	14.26

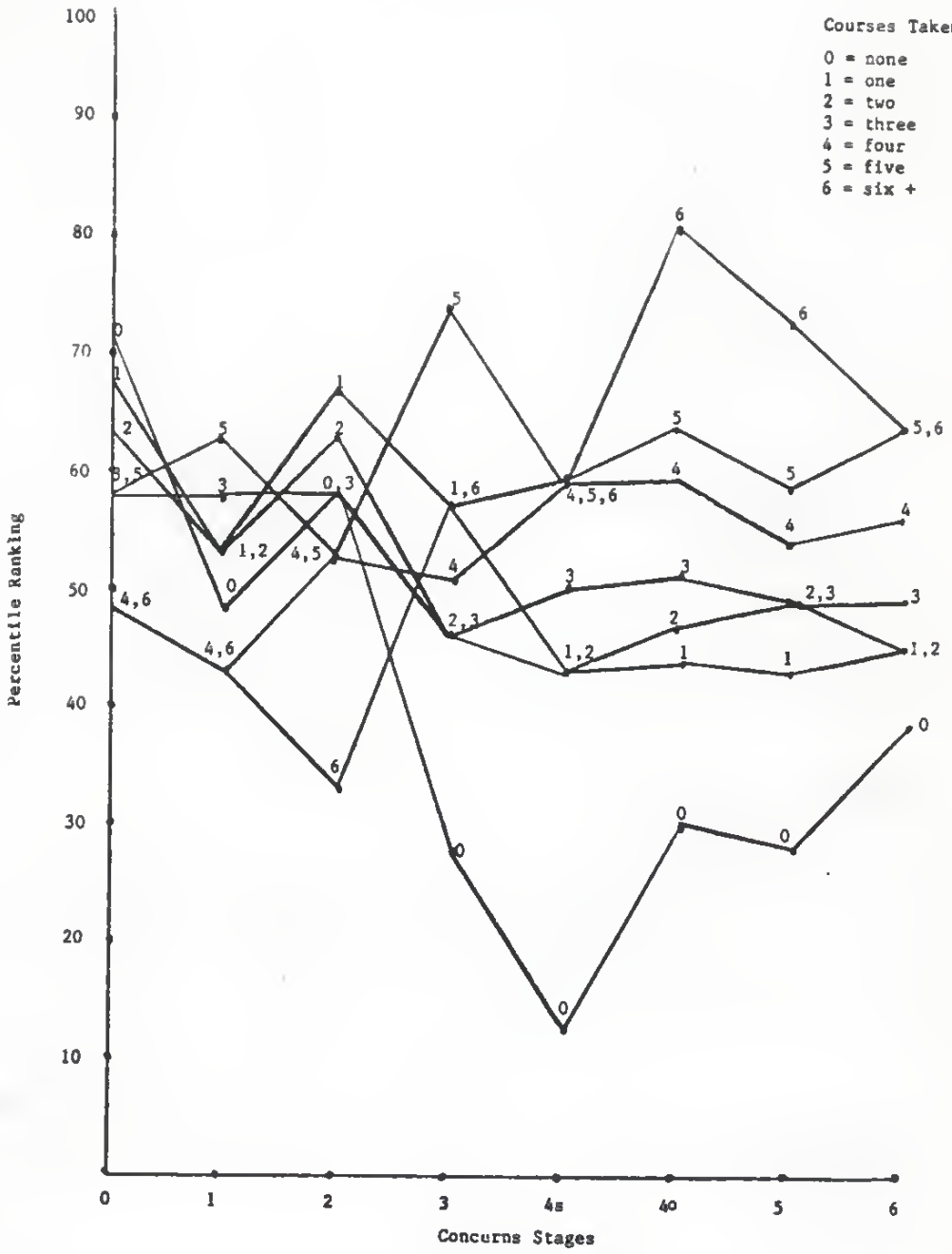

Figure 1. Concerns profiles of respondents with mean percentile scores for number of courses taken plotted against concerns stages.

The results of eight separate one-way ANOVAs are displayed in Table 29. F probability indicated that the differences in raw stage score means among different "courses" groups were significant at the .05 level for stages 0, 2, 3, 4s, 4o, 5, and 6 (and nearly so for stage 1 where p=.10) at the .01 level. The number of courses taken clearly was a significant factor in predicting all stage scores except stage 1 (informational concerns).

Table 29

F Probabilities and F Values for Main Effects of Number of Courses Taken on Subjects' SoC Scores

	F Probability for Each Stage F Value for Each Stage							
	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	SoC 6
p	.0001*	.10	.0001*	.0001*	.0001*	.0001*	.0001*	.0001*
F	4.92	1.80	12.63	5.39	13.00	28.09	14.08	6.79

* Significant Difference at the .01 Level

Because a relationship between seven of the eight stages of concern and the seven levels of courses taken had been demonstrated, and because several of the stages appeared to be linearly related to the levels of courses taken, an additional analysis was done to test for linearity. The results of the use of the restricted model,

a specific test for linearity, are reported in Table 30. Linearity (i.e. that the SoC scores either increase or decrease a constant amount as the number of courses taken increases) was present for all stages except stage 1. Stages 3, 4s, 4o, 5 and 6 had positive correlations (these SoC scores increased as number of courses taken increased, while stages 0 and 2 had negative correlations (these SoC scores decreased as number of courses taken increased).

Table 30

r Correlations, F Probabilities, and F Values to Determine Whether Number of Courses Taken is Related to Stage Score Means in a Linear Fashion

(*=Significant at the .01 Level)

	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
r	-.26*	-.08	-.37*	.17*	.28*	.55*	.41*	.30*
p	.0001*	.10	.0001*	.0007*	.0001*	.0001*	.0001*	.0001*
F	27.17	2.69	62.67	11.59	33.70	168.31	77.61	39.37

In Figure 2 percentiles were plotted against the number of courses taken for those stages of concern that showed a linear relationship (stages 0, 2, 3, 4s, 4o, 5, and 6). Again, it was noted that stages 0 and 2 mean scores

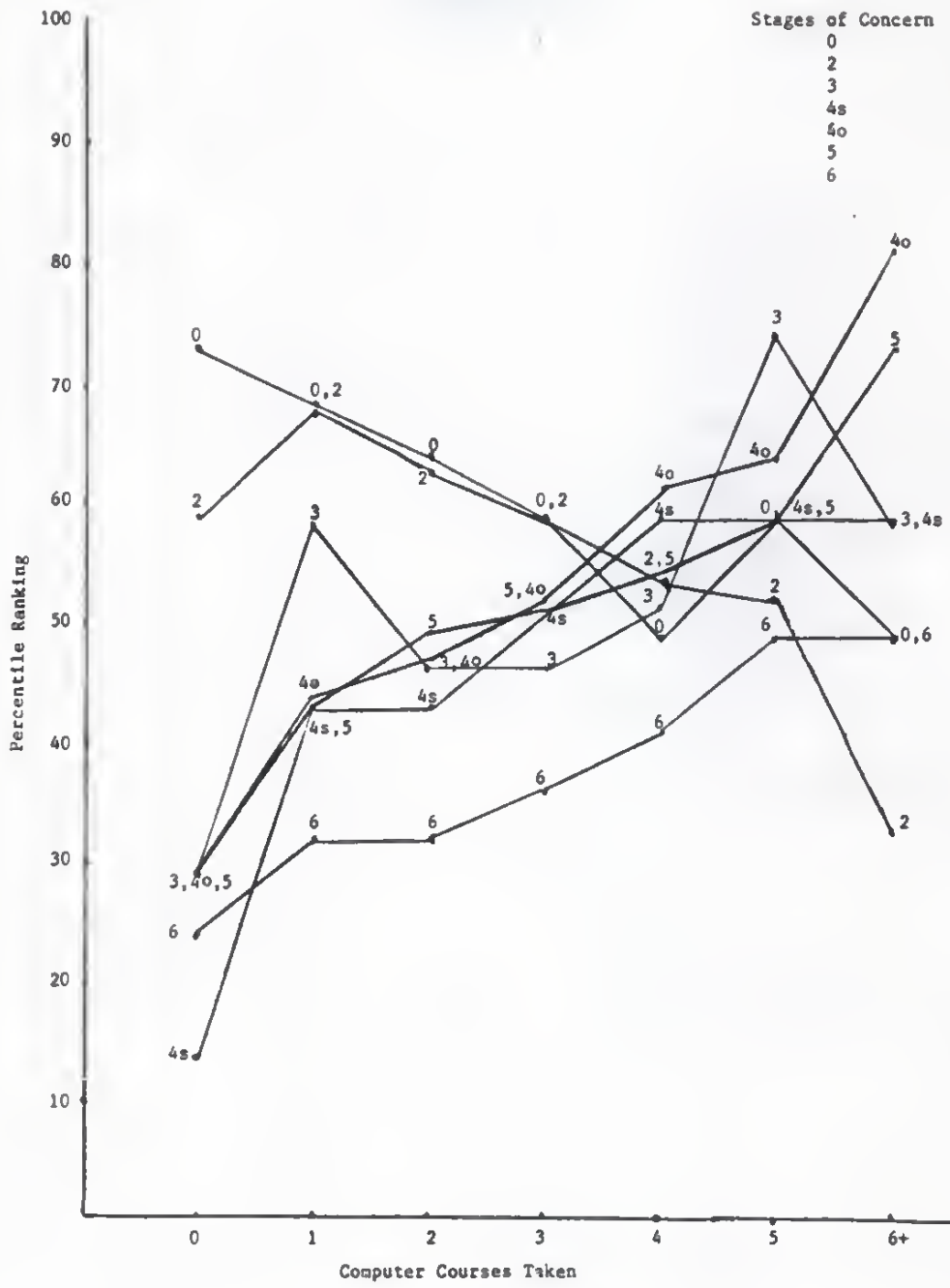

Figure 2. Stages of Concern mean percentile scores plotted against number of computer courses taken.

decreased as the number of courses increased (a negative correlation) while stages 3, 4s, 4o, 5, and 6 mean scores increased as the number of courses increased (a positive correlation).

Duncan's Multiple Range Test was then used to determine which groups (for number of courses taken) actually had significantly different means at any given stage of concern. This test can be used, following a significant F ratio in ANOVA, to test the significance of differences between particular group means or combinations of group means (Borg, & Gall, 1983).

Table 31

Location of Differences in Stages of Concern Scores Across Seven Levels of Number of Courses Taken

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Numbers of Courses Between Which Significant Differences Were Found	0-5 0-6 0-4 1-6 1-4 2-6 2-4	5-4 5-6	1-5 1-4 1-6 2-6	5-6 5-1 5-4 5-2 5-3 5-0 6-0 1-0 4-0 2-0 3-0	5-0 4-0 6-0 3-0 2-0 1-0	6-5 6-4 6-3 6-2 6-1 6-0 5-3 5-2 5-1 5-0 4-3 4-2 4-1 4-0 3-0 2-0	6-4 6-3 6-2 6-1 6-0 5-1 5-0 4-0 3-0 2-0 1-0	6-3 6-2 6-1 6-0 5-3 5-2 5-1 5-0 4-0

The subjects had taken various numbers of computer courses (0, 1, 2, 3, 4, 5, or 6 [actually 6 represents 6 or more courses]) and their mean scores for all stages of concern were tallied. Within the SoC-0 items, represented in Column 0, significant differences were found in the mean SoC scores between those taking 0 and 5 courses, between those taking 0 and 6 courses, between those taking 0 and 4 courses, between those taking 1 and 6 courses, between those taking 1 and 4 courses, between those taking 2 and 6 courses, and between those taking 2 and 4 courses. All other comparisons of mean scores of SoC-0 items across various numbers of computer courses taken were found not to be significant. Significant differences for the "number of courses taken" subgroups at other Stages of Concern may be located in the same fashion in their respective columns.

In summary, please note that the ANOVA yielded significant relationships between all stages of concern (except stage 1) and number of courses taken. In addition, the linear relationships were reported in Table 30. Finally, Table 31 (Duncan) displayed all significant differences between groups.

Results Pertaining to Question 4

What are the relationships between the intensities of various concern stages and the computing application experience levels of individuals?

This question was addressed initially by converting raw scores to percentiles using the following technique. The raw score for each stage is the sum of the responses to the four questions associated with that stage. Hence, the raw score values ranged from 0 to 28 for each stage. In order to plot SoC "profiles" raw scores were converted to percentiles. See Table 32.

ANOVA test results are shown for the word processing experience factor with the results reported in Table 33.

Table 32

Percentiles for Raw Scores for Eight Stages of Concern Across Twenty-Nine Raw Scores

Raw Score	SoC 0	SoC 1	SoC 2	SoC 3	SoC 4s	SoC 4o	SoC 5	SoC6
0	1	0	0	2	1	6	1	6
1	3	0	1	2	1	10	2	11
2	5	1	1	3	1	13	4	15
3	9	1	3	4	2	18	7	19
4	25	2	5	6	2	21	12	23
5	33	3	8	8	2	26	14	27
6	41	5	10	10	2	30	17	30
7	49	8	15	13	3	33	19	34
8	53	10	21	16	3	38	24	38
9	58	14	26	21	3	44	28	42
10	64	16	33	26	4	47	32	45
11	68	19	38	28	4	51	36	49
12	72	25	43	33	5	54	40	56
13	77	29	48	40	7	56	43	61
14	80	32	53	46	8	60	49	64
15	83	35	58	51	12	64	54	70
16	85	43	63	57	13	69	59	75
17	87	48	67	61	17	74	62	80
18	90	53	71	68	20	78	67	83
19	91	58	75	74	22	81	73	86
20	93	63	78	78	27	84	76	91
21	94	68	81	84	35	86	80	92
22	95	73	84	88	43	89	84	94
23	96	79	86	90	50	91	87	95
24	97	83	90	93	59	94	90	97
25	98	87	92	95	68	95	92	98
26	99	90	94	96	76	96	94	98
27	99	92	95	98	83	97	96	99
28	100	100	100	100	100	100	100	100

Table 33

F Probabilities and F Values for Main Effects of Word Processing Experience on Subjects SoC Scores (*=significant at .05, ** at .01 level)

	F Probability for Each Stage F Value for Each Stage							
	SoC 0	SoC 1	SoC 2	SoC 3	SoC 4s	SoC 4o	SoC 5	SoC 6
p	.00**	.01*	.00**	.00**	.00**	.00**	.00**	.00**
F	7.00	3.82	22.79	14.65	18.34	20.34	16.16	10.85

Word processing experience was a significant main effect difference in mean scores of subjects at all stages of concern. Duncan's Multiple Range Test was then used (following a significant F ratio in analysis of variance) to test the statistical significance of differences between all pairs of group means. The group means for subjects at each stage of concern were analyzed by level of word processing experience. Duncan's Multiple Range Test was used to identify the location of significant main effect differences associated with several independent variables.

As noted in Tables 34A and 34B, stages 4o and 5 concerns increased with the amount of word processing or spreadsheet experience, while stage 0 concerns decreased

with the amount of word processing or spreadsheet experience. There are other relationships to be seen, but none are as clear as for those three stages of concern.

In the next six tables, the level of experience for word processing, spreadsheets, graphics, database, games, and "other" were classified as follows:

0= those having none

1= those having less than 6 months

2= those having less than 12 months

3= those having more than 12 months

Table 34A

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of Word Processing Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of W. Proc. Experience Between Which Significant Differences Were Found	0-2 0-3 1-2 1-3	1-0	1-2 1-3 0-3 2-3	3-0 1-0 2-0	3-0 1-0 2-0	3-2 3-1 3-0 2-0 1-0	3-1 3-0 3-1 3-0	2-1 2-0

Table 34B

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of Spreadsheet Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Spread. Experience Between Which Significant Differences Were Found	0-2 0-3 1-2 1-3		1-2 1-3 0-2 0-3	3-2 3-0	3-0 1-0 2-0	3-2 3-1 3-0 2-0	3-2 3-1 3-0 2-0	3-1 3-0 2-1

See Figures 3 and 4 for the plots of percentiles for mean scores (for word processing and spreadsheet experience) against the stages of concern.

In the next two tables (Tables 35A and 35B) note that stage 2 concerns decreased for subjects with greater graphics or database experience, while stages 4o and 5 concerns increased for these same subjects.

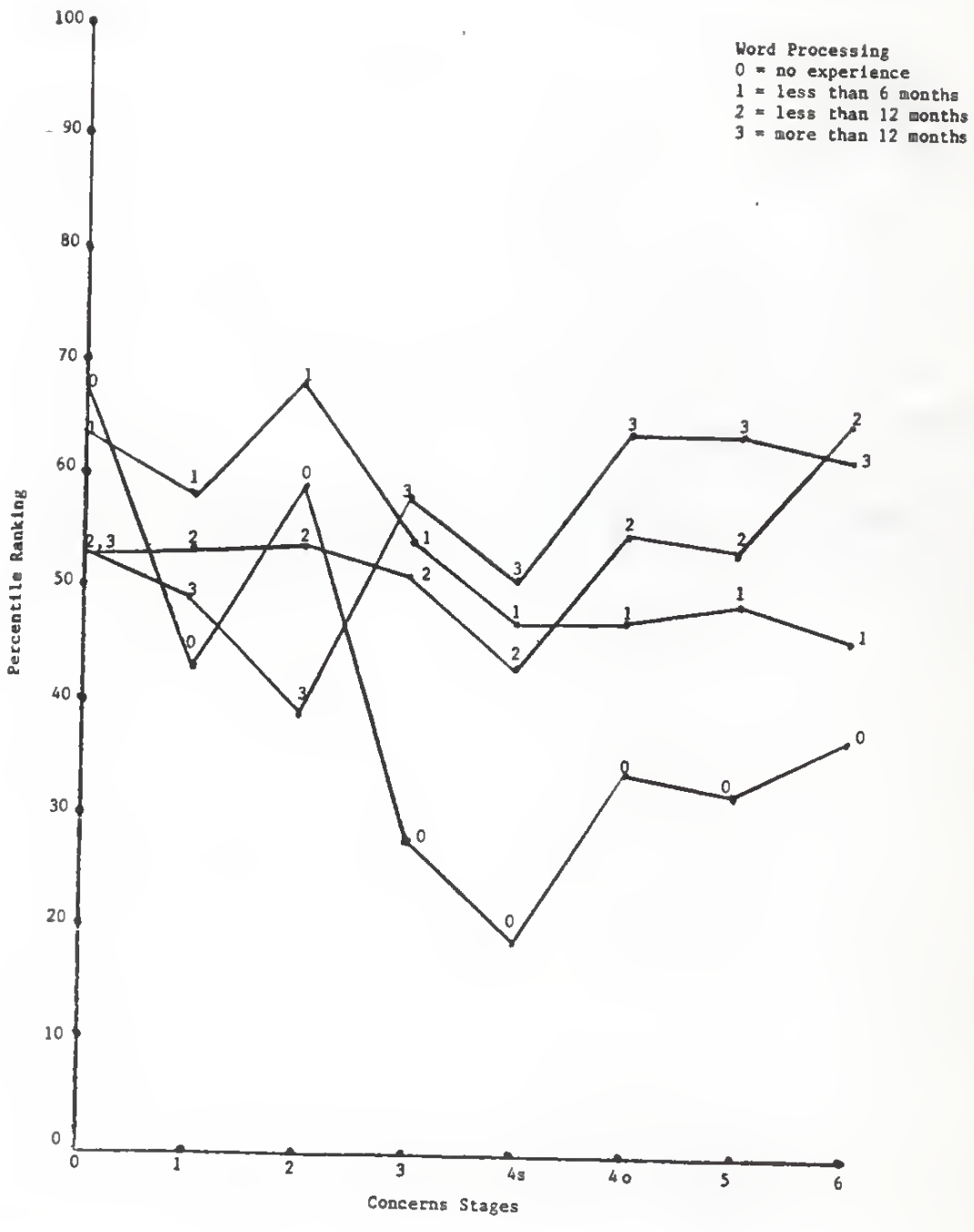

Figure 3. Concerns profiles of respondents with mean percentile scores for levels of word processing experience plotted against concerns stages.

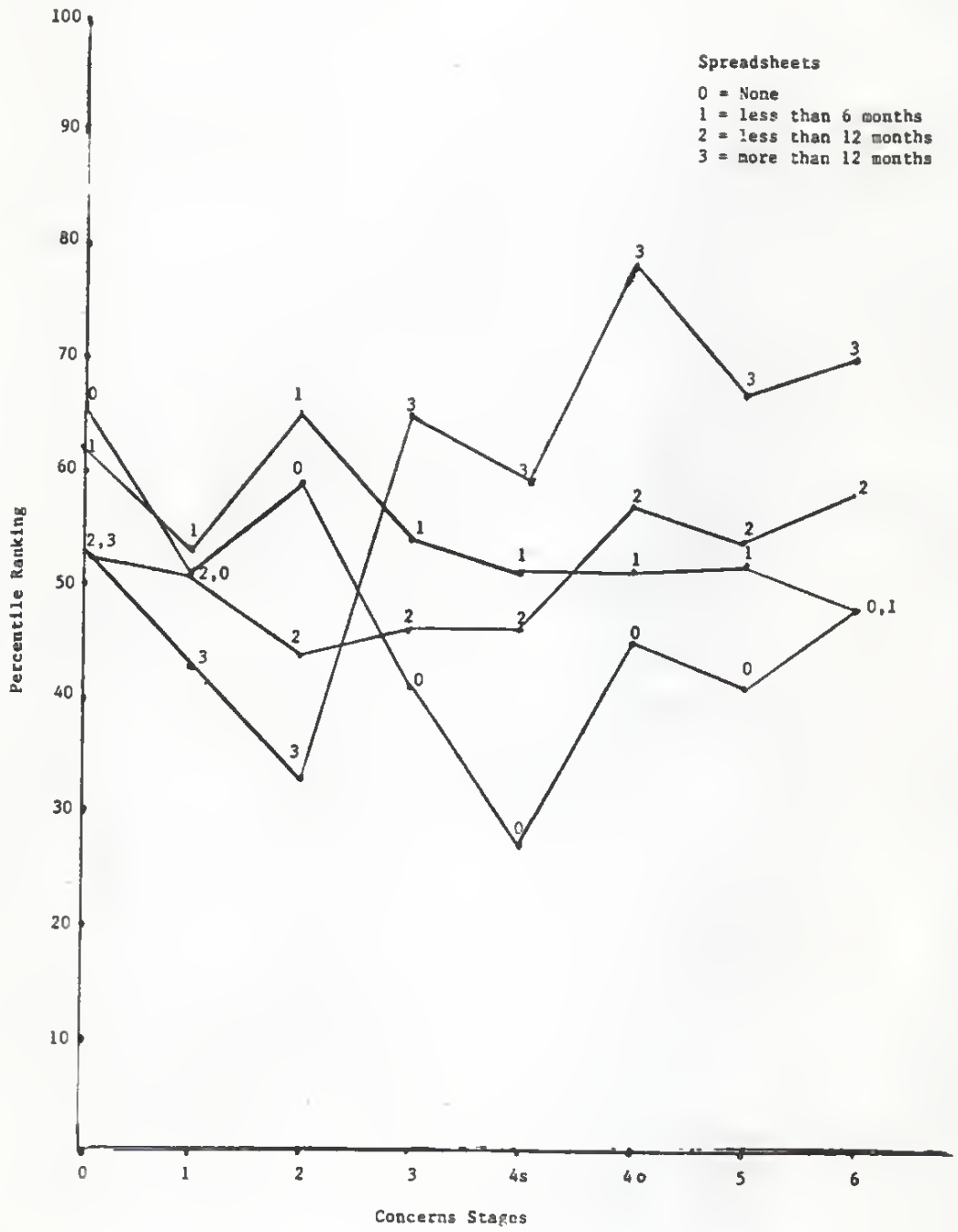

Figure 4. Concerns profiles of respondents with mean percentile scores for levels of spreadsheet experience plotted against concerns stages.

Table 35A

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of Graphics Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Graphics Experience Between Which Significant Differences Were Found	0-3 0-2	0-2 1-2 3-2	0-2 0-3 1-2 1-3	3-0	3-2 3-0	3-0 2-0	3-2 3-1 3-0	3-1 3-0

Table 35B

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of Database Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Database Experience Between Which Significant Differences Were Found	0-3	2-3	0-2 0-3 1-2 1-3	3-2 3-0	3-0	3-2 3-1 3-0 2-0	3-1 3-0 2-0	3-2 3-0

In Tables 36A and 36B note how stage 4o concerns increased with the amount of games or "other" experience, while stage 2 concerns decreased with the amount of games or

other experience (just as for graphics and database experience).

Table 36A

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of Games Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Games Experience Between Which Significant Differences Were Found	0-2		1-3 0-3	3-0 1-0	3-0 1-0	3-0 2-0		

Table 36B

Location of Significant Mean Score Differences of Items Representing Eight Stages of Concern Across Four Levels of "Other" Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of "other" Experience Between Which Significant Differences Were Found			1-3 0-3 2-3			3-2 3-0 3-1 2-1	3-0 3-1	3-1 2-1

Each of the six preceding "experience" scores for an individual person in the areas of word processing, spreadsheets, graphics, database, games, and "other" range from 0 to a maximum of 3. Thus by summing scores from the six experience areas into a total experience score, an individual's score could range from 0 to 18. Table 37 provides the cumulative percentages for each possible total experience score.

Table 37

Cumulative Percentages Across Eighteen Total Experience Scores

Total Experience	Cumulative Percentage
0	5
1	11
2	18
3	27
4	39
5	45
6	53
7	63
8	68
9	74
10	77
11	79
12	83
13	86
14	89
15	92
16	93
17	95
18	100

Another way to view these data then is to classify persons according to the sum total of their experience as having none, little, less than average, more than average, or "high", as given in Table 38.

Table 38

Cumulative Percentages Across Five Arbitrary Levels of Experience

Group	Total Experience	Cumulative Percentage
0	none=raw score total of 0	5
1	little=raw score total between 1 and 3	27
2	<average=raw score total between 4 and 6	53
3	>average=raw score total between 7 and 12	83
4	high= raw score total between 13 and 18	100

The results displayed in Table 39 indicated that raw scores for stages 3, 4s, 4o, 5, and 6 all increased as the experience increased; the results were more ambiguous for stages 0, 1, and 2.

Table 39

Location of Differences in Stages of Concern Scores Across Five Levels of Total Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Total Experience Between Which Significant Differences Were Found	1-3 1-4 2-4 0-4	1-0	2-3 2-4 1-3 1-4 0-4 3-4	4-1 4-0 3-0 2-0 1-0	4-1 4-0 3-0 2-0 1-0	4-3 4-1 4-2 4-0 3-1 3-2 3-0 1-0 2-0	4-3 4-1 4-2 4-0 3-0 1-0 2-0	4-3 4-2 4-1 4-0 3-0 2-0

Figure 5 displays the percentile scores for each level (0 through 4) of "total experience" plotted against the stages of concern.

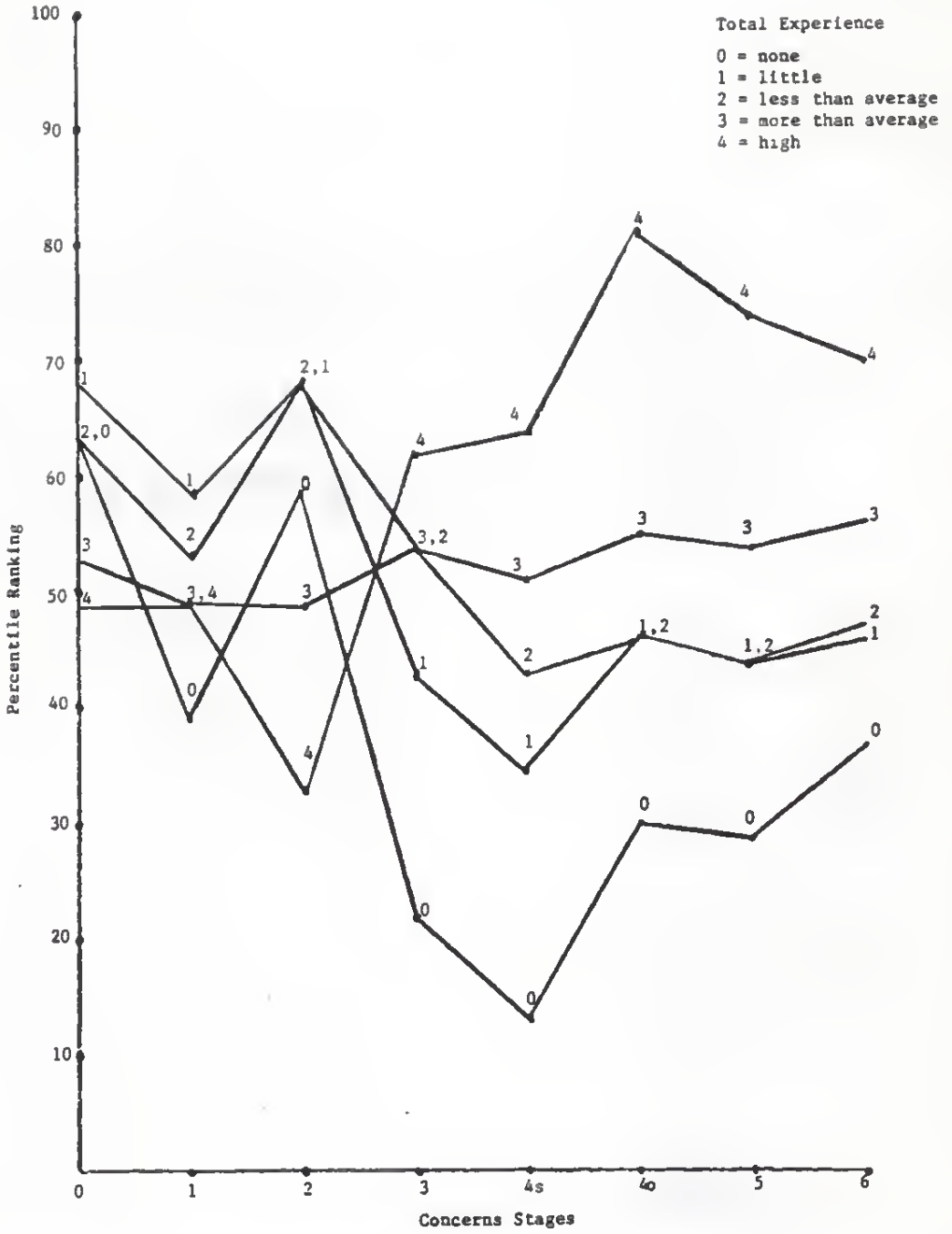

Figure 5. Concerns profiles of respondents with mean percentile scores for level of total experience plotted against concerns stages.

The following table (Table 40) is a recapitulation of Tables 34A, 34B, 35A, 35B, 36A, 36B, and Table 39 for ease of comparison of experimental variables and SoC scores.

Table 40

Location of Differences in Stages of Concern Scores Across Four Levels of Various Kinds of Experience and Five Levels of Total Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Word Processing								
Levels of W. Proc. Experience Between Which Significant Differences Were Found	0-2 0-3 1-2 1-3	1-0	1-2 1-3 0-3 2-3	3-0 1-0 2-0	3-0 1-0 2-0	3-2 3-1 3-0 2-0 1-0	3-1 3-0 3-1 3-0	2-1 2-0
Spreadsheets								
Levels of Spread. Experience Between Which Significant Differences Were Found	0-2 0-3 1-2 1-3		1-2 1-3 0-2 0-3	3-2 3-0	3-0 1-0 2-0	3-2 3-1 3-0 2-0	3-2 3-1 3-0 2-0	3-1 3-0 2-1
Graphics								
Levels of Graphics Experience Between Which Significant Differences Were Found	0-3 0-2	0-2 1-2 3-2	0-2 0-3 1-2 1-3	3-0	3-2 3-0	3-0 2-0	3-2 3-1 3-0	3-1 3-0

Table 40--Continued

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Database								
Levels of Database Experience Between Which Significant Differences Were Found	0-3	2-3	0-2 0-3 1-2 1-3	3-2 3-0	3-0	3-2 3-1 3-0 2-0	3-1 3-0 2-0	3-2 3-0
Games								
Levels of Games Experience Between Which Significant Differences Were Found	0-2		1-3 0-3	3-0 1-0	3-0 1-0	3-0 2-0		
Other								
Levels of "other" Experience Between Which Significant Differences Were Found			1-3 0-3 2-3			3-2 3-0 3-1 2-1	3-0 3-1	3-1 2-1
Total Experience								
Levels of Total Experience Between Which Significant Differences Were Found	1-3 1-4 2-4 0-4	1-0	2-3 2-4 1-3 1-4 0-4 3-4	4-1 4-0 3-0 2-0 1-0	4-1 4-0 3-0 2-0 1-0	4-3 4-1 4-2 4-0 3-1 3-2 3-0 1-0 2-0	4-3 4-1 4-2 4-0 3-0 1-0 2-0	4-3 4-2 4-1 4-0 3-0 2-0

The next set of analyses addressed the "job use" and "personal use" variables. Job or personal "use" in these cases was the sum of values (0=not used and 1=used) derived from the following nine variables: writing, calculating/ spreadsheet, graphics, file management/database, telecommunications, data entry, programming, games/ entertainment, and special purpose/tax including tax and finance.

The "job use" and "personal use" scores for an individual each could thus range from 0 (no use of any of the 9 variables) to a maximum of 9 (use of all nine variables). The cumulative percentages for the sample are reported in Table 41.

An alternative way to view these data is to classify persons according to the sum total of their job or personal use experience as in Table 42.

Table 41

Job Use and Personal Use Cumulative Percentages Across Ten Levels of Use

Use	Cumulative Job Use Percent	Cumulative Personal Use Percent
0	33	21
1	45	38
2	54	51
3	67	62
4	75	72
5	84	81
6	89	87
7	95	91
8	98	94
9	100	100

Table 42

Cumulative Percentages Across Four Arbitrary Levels of Use

Job Use Experience	Cumulative Percent
0= none=raw score total of 0	33
1= little=raw score total between 1 and 2	54
2= <average=raw score total between 3 and 5	84
3= >average=raw score total between 6 and 9	100

Personal Use Experience	Cumulative Percent
0= none=raw score total of 0	21
1= little=raw score total between 1 and 2	51
2= <average=raw score total between 3 and 5	81
3= >average=raw score total between 6 and 9	100

Note in Tables 43A and 43B that stages 3, 4s, 4o, 5, and 6 concerns increased with the amount of job use or personal use, but stages 0 and 2 concerns decreased with the amount of job or personal use. Scores on stage 1 did not differ among these groups.

Table 43A

Location of Differences in Stages of Concern Scores Across Four Levels of Job Use

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Job Use Between Which Significant Differences Were Found	0-1		0-2	3-2	3-0	3-2	3-2	3-2
	0-2		0-3	3-1	1-0	3-1	3-1	3-0
	0-3		1-2	3-0	2-0	3-0	3-0	3-1
	1-3		1-3			2-1	2-0	2-1
	2-3		2-3			2-0		

Table 43B

Location of Differences in Stages of Concern Scores Across Four Levels of Personal Use

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Personal Use Between Which Significant Differences Were Found	0-2		0-2	3-1	3-0	3-2	3-2	3-2
	0-3		0-3	3-0	2-0	3-1	3-1	3-1
	1-3		1-2			3-0	3-0	3-0
			1-3			2-1	2-0	2-0
			2-3			2-0		

The percentiles for job use and personal use (for each of the four levels of experience) were plotted against the stages of concern in Figures 6 and 7.

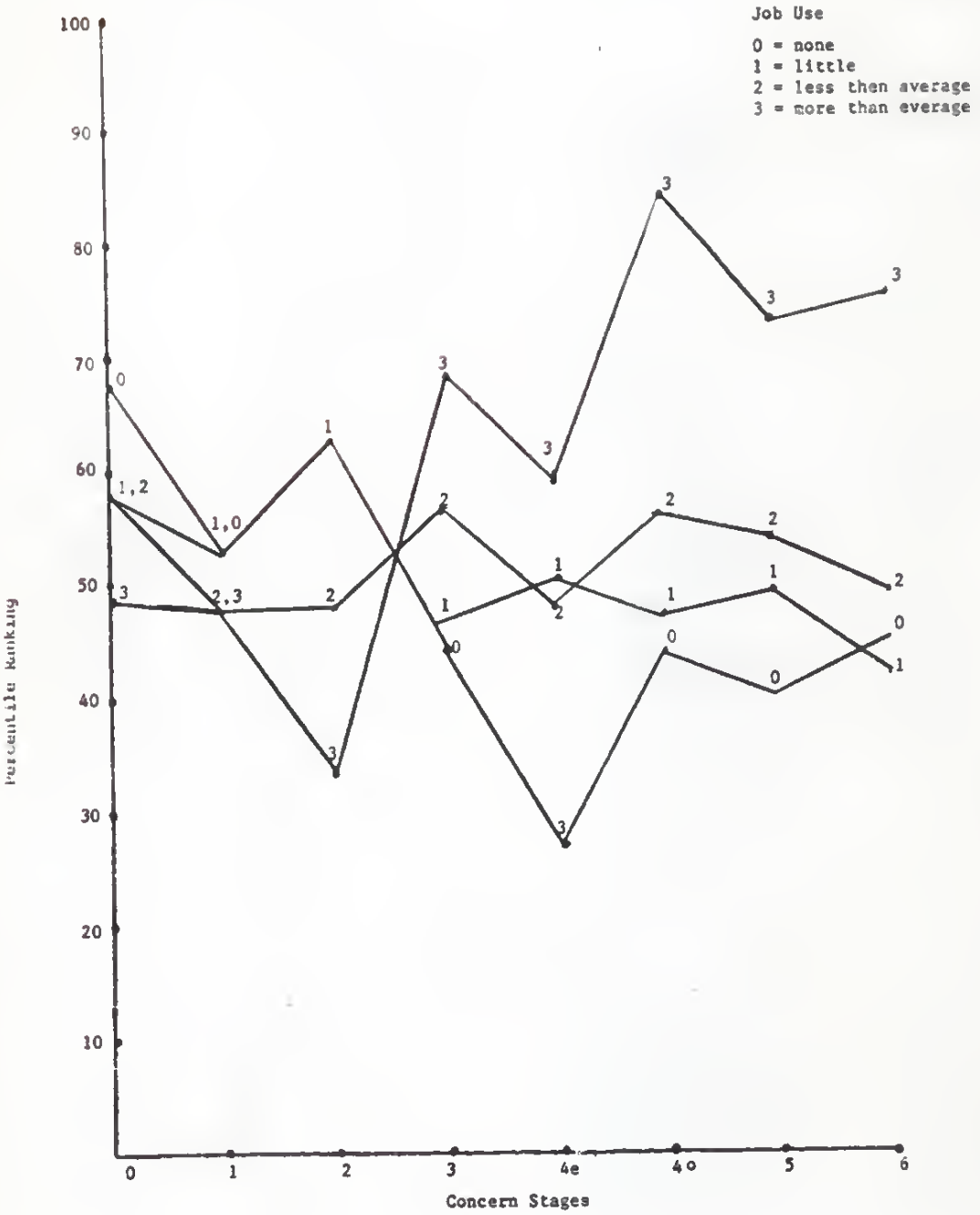

Figure 6. Concerns profiles of respondents with mean percentile scores for levels of job use plotted against concerns stages.

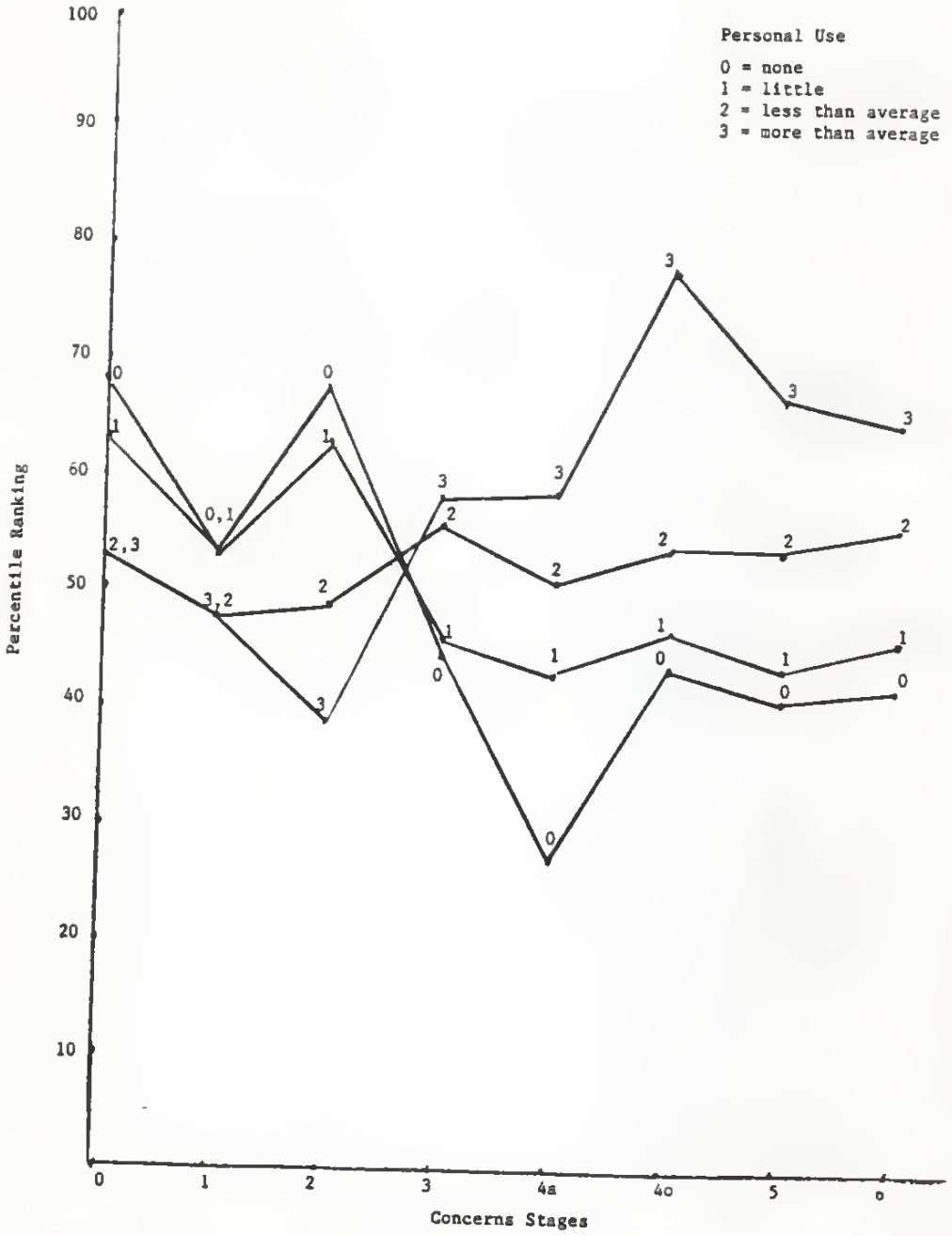

Figure 7. Concerns profiles of respondents with mean percentile scores for levels of personal use plotted against concerns stages.

Mean scores for stages 4o, 5, and 6 increased as the time or perceived expertise variable increased; stage 0 scores, on the other hand, declined as expertise increased; stage 2 scores (personal concerns) were determined to have a significant (non-linear) relationship with the amount of expertise. See Tables 44A and 44B.

Table 44A

Location of Differences in Stages of Concern Across Seven Levels of Time Experience

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Time Experience Between Which Significant Differences Were Found	2-5	3-6	2-3	6-0	6-1	6-5	6-4	6-4
	2-6	3-0	2-0	4-0	6-3	6-3	6-2	6-2
	0-6		2-5	2-0	6-0	6-4	6-3	6-1
	1-6		2-6	5-0	4-0	6-1	6-1	6-0
			1-3	1-0	5-0	6-2	6-0	5-1
			1-0	3-0	2-0	6-0	5-1	5-0
			1-5		1-0	5-1	5-0	3-0
			1-6		3-0	5-2	4-0	4-0
			4-0			5-0	2-0	2-0
			4-5			3-0	3-0	1-0
			4-6				1-0	
			3-5					
			3-6					

(0=never, 1=0 to 3 months, 2=more than 3 months, 3=more than 6 months, 4=more than 1 year, 5=more than 3 years, 6=more than 5 years)

Table 44B

Location of Differences in Stages of Concern Scores Across Four Levels of Expertise

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Expertise Between Which Significant Differences Were Found	0-3 1-3		1-0 1-2 1-3 0-2 0-3 2-3	3-1 3-0 2-0	3-0 2-0 1-0	3-2 3-1 3-0 2-1 2-0 1-0	3-2 3-1 3-0 2-1 2-0 1-0	3-1 3-0 2-1 2-0 1-0

(0=non-user, 1=novice, 2=intermediate, 3=old hand)

Note in Tables 45A, 45B and 45C that stages 0 and 2 scores decreased with language experience, while stages 4s, 4o, and 5 scores increased with language experience. Students had higher stage 2 scores than non-students, but non-students had higher stage 4o, 5, and 6 scores. Non-professionals had higher stage 0, 1, and 2 scores than professionals, while professionals had higher stage 3, 4s, 4o, 5, and 6 scores.

Table 45A

Location of Differences in Stages of Concern Scores Across Levels of Computer Language Use

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Levels of Language Use Betw. Which Significant Differences Were Found	0-3 1-3	1-3 2-3 0-3	0-2 0-3 1-2 1-3	2-0 3-0	3-0 2-0	3-2 3-1 3-0 2-1 2-0	3-1 3-0 2-1 2-0	2-0 3-0 1-0

(0=no languages, 1=one language,
2=two or three languages, 3=four or more languages)

Table 45B

Location of Differences in Stages of Concern Scores Across Student vs. Non-Student Classification

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Classifications Between Which Significant Differences Were Found			1-0			0-1		0-1

(1=student, 0=non-student)

Table 45C

Location of Differences in Stages of Concern Scores Across Professional vs. Non-Professional Classification

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Classifications Between Which Significant Differences Were Found	0-1	0-1	0-1	1-0	1-0	1-0	1-0	1-0

(1=professional, 0=non-professional)

Table 46 is simply a recapitulation of Tables 44A, 44B, 45A, 45B, and 45C.

Percentiles were plotted for each level of time, expertise, languages, student, and professional variables against the stages of concern. See Figures 8 through 12.

Table 46

Location of Differences in Stages of Concern Scores Across Seven Levels of Time Experience, Four Levels of Expertise, Four Levels of Computer Language Use, Student vs. Non-Student Classification, and Professional vs. Non-Professional Classification

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Time								
Levels of Time Experience Between Which Significant Differences Were Found	2-5 2-6 0-6 1-6	3-6 3-0	2-3 2-0 2-5 2-6 1-3 1-0 1-5 1-6 4-0 4-5 4-6 3-5 3-6	6-0 4-0 2-0 5-0 1-0 3-0	6-1 6-3 6-0 4-0 5-0 2-0 1-0 3-0	6-5 6-3 6-4 6-1 6-2 6-0 5-1 5-2 5-0 3-0	6-4 6-2 6-3 6-1 6-0 5-1 5-0 4-0 2-0 3-0 1-0	6-4 6-2 6-1 6-0 5-1 5-0 3-0 4-0 2-0 1-0
Expertise								
Levels of Expertise Between Which Significant Differences Were Found	0-3 1-3		1-0 1-2 1-3 0-2 0-3 2-3	3-1 3-0 2-0	3-0 2-0 1-0	3-2 3-1 3-0 2-1 2-0 1-0	3-2 3-1 3-0 2-1 2-0 1-0	3-1 3-0 2-1 2-0 1-0
Languages								
Levels of Language Use Betw. Which Significant Differences Were Found	0-3 1-3	1-3 2-3 0-3	0-2 0-3 1-2 1-3	2-0 3-0	3-0 2-0	3-2 3-1 3-0 2-1 2-0	3-1 3-0 2-1 2-0	2-0 3-0 1-0

Table 46--Continued

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Student								
Classifications Between Which Significant Differences Were Found			1-0			0-1		0-1
Professional								
Classifications Between Which Significant Differences Were Found	0-1	0-1	0-1	1-0	1-0	1-0	1-0	1-0

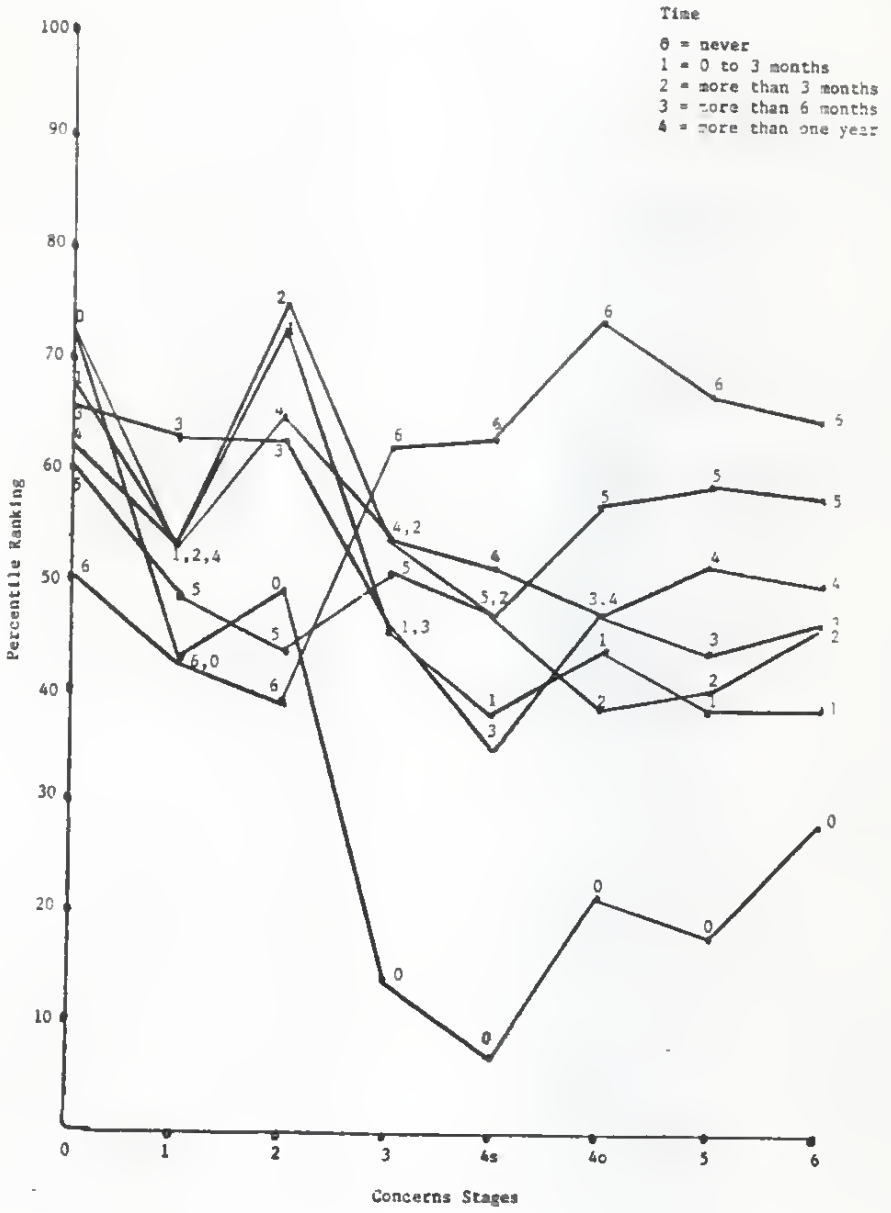

Figure 8. Concerns profiles of respondents with mean percentile scores for length of experience plotted against concerns stages.

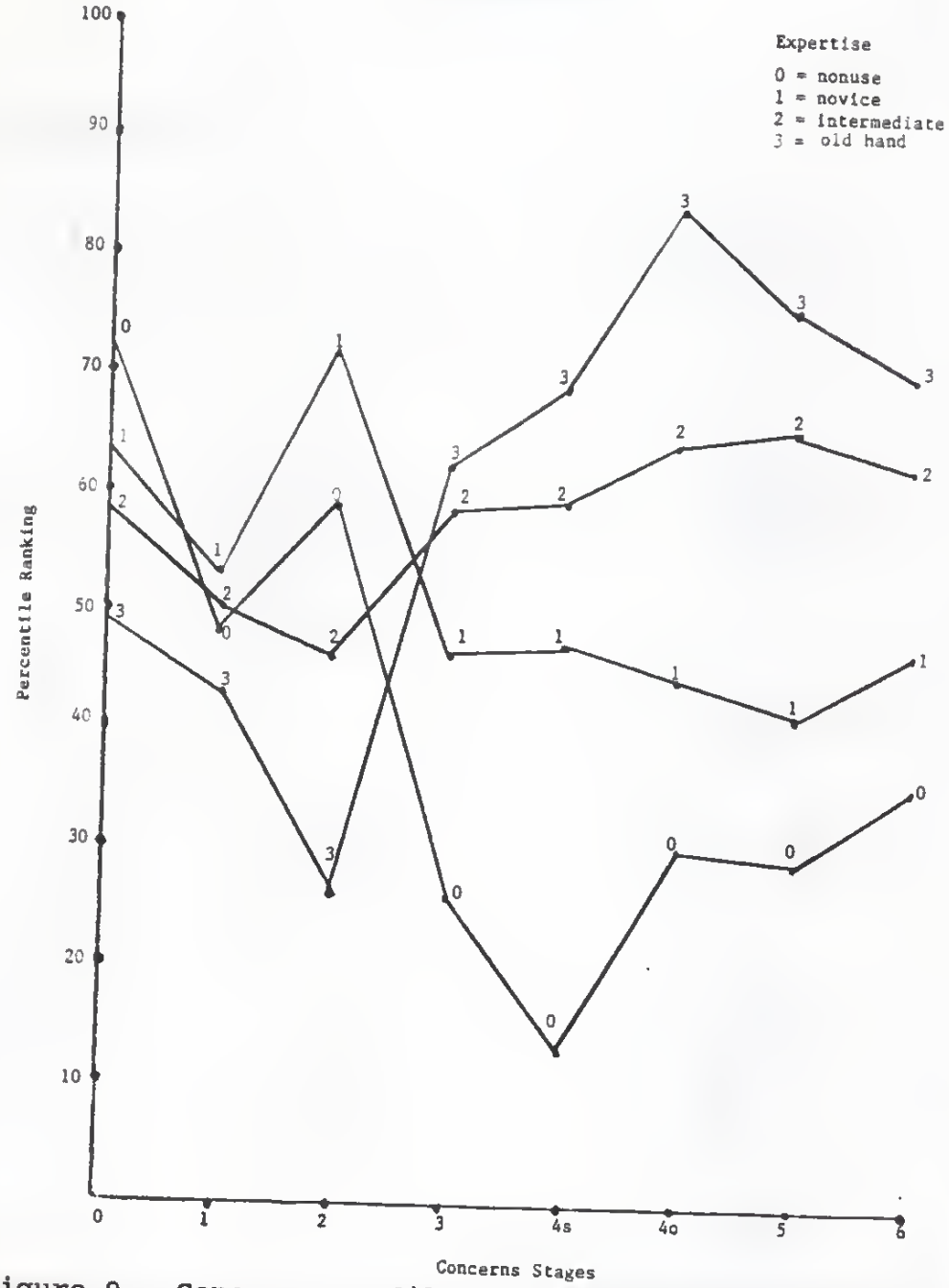

Figure 9. Concerns profiles of respondents with mean percentile scores for levels of expertise plotted against concerns stages.

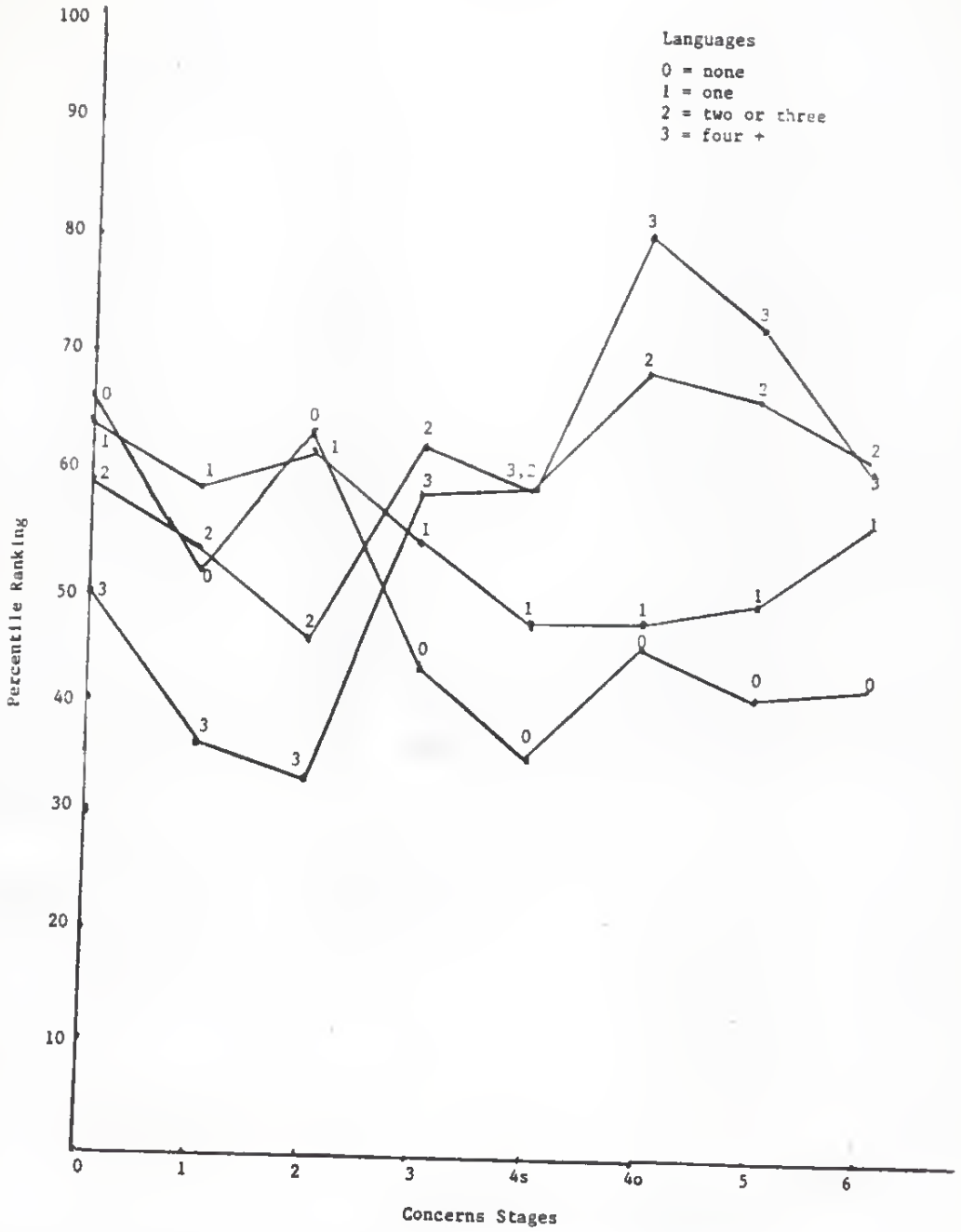

Figure 10. Concerns profiles of respondents with mean percentile scores for number of languages plotted against concerns stages.

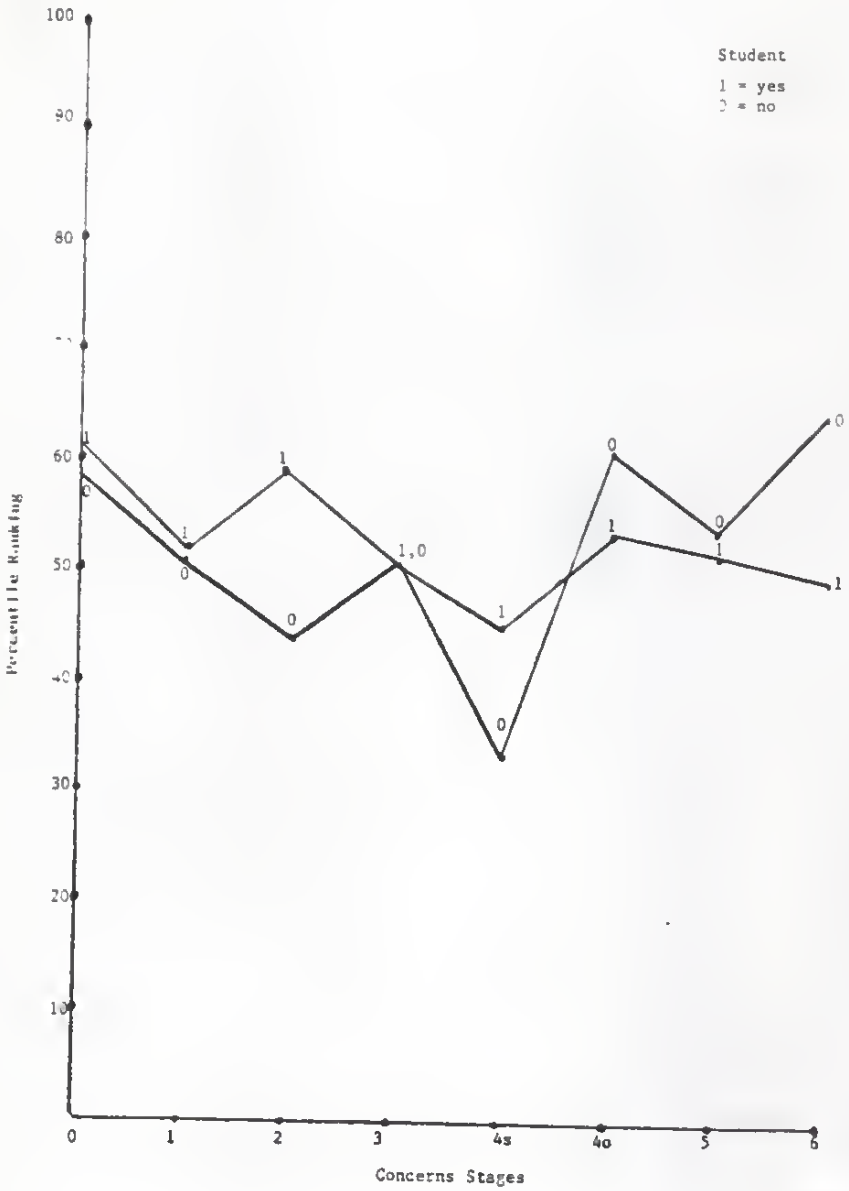

Figure 11. Concerns profiles of respondents with mean percentile scores for students and non-students plotted against concerns stages.

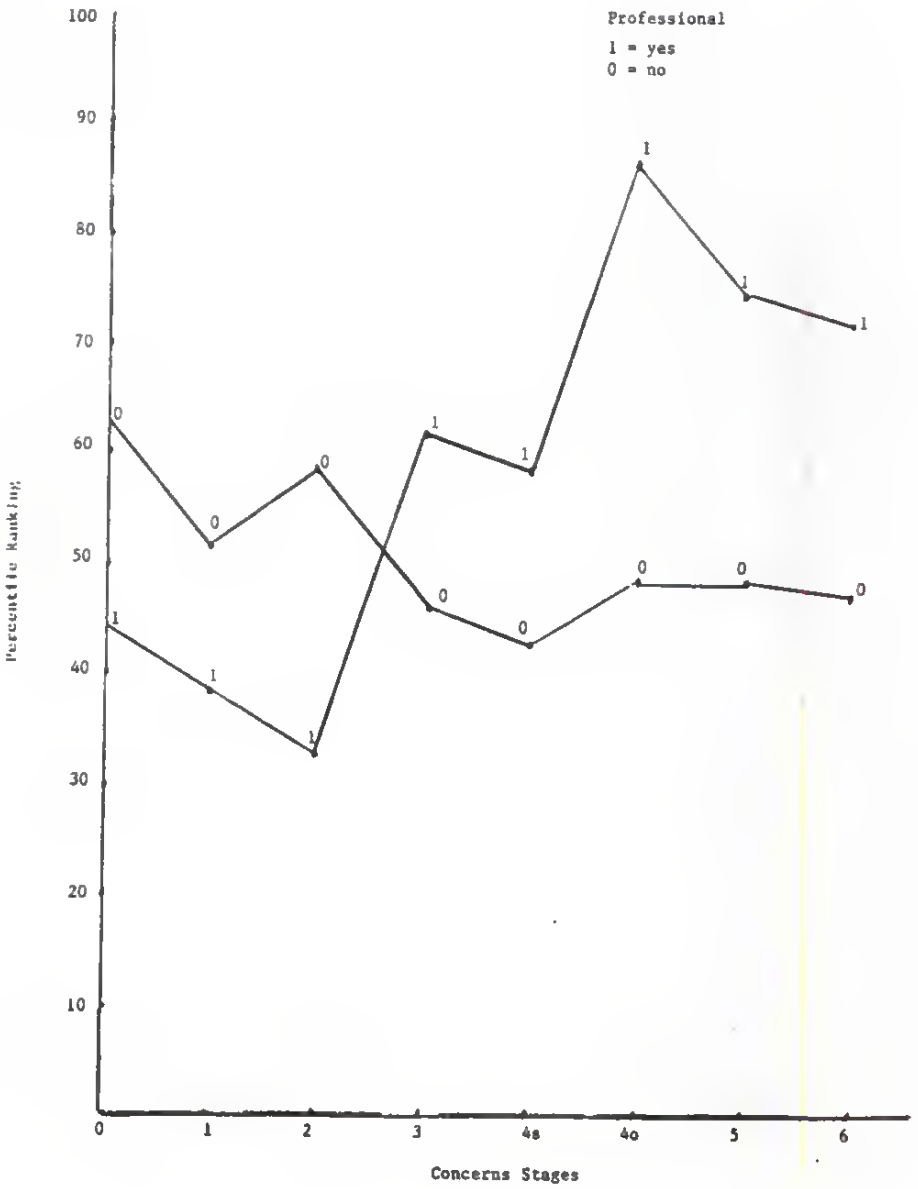

Figure 12. Concerns profiles of respondents with mean percentile scores for professionals and non-professionals plotted against concerns stages.

Results Pertaining to Question 5

What are the associations between age and gender with SoC scores?

The initial analysis for this question was undertaken to determine whether gender was related to SoC scale scores. Correlations displayed in Table 47 suggested that linearity was present for stages 1, 2, 4o, and 6. Note that stages 1 and 2 had positive correlations which meant females scored higher than males, while correlations at stages 4o and 6 were negative which meant males scored higher than females at those stages. The percentiles for gender against stages of concern are plotted in Figure 13.

Table 47

Comparison of Stage Score Means by Gender of Respondent with Corresponding Correlations (*= significant at .05, ** at .01 level)

Group Gender	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
1 Male N=179	8.99	16.72	13.40	14.87	22.08	13.15	14.70	12.01
2 Female N=207	9.74	18.28	15.38	15.11	22.23	10.71	14.28	10.32
r	.06	.12*	.15**	.01	.02	-.16**	-.03	-.12**

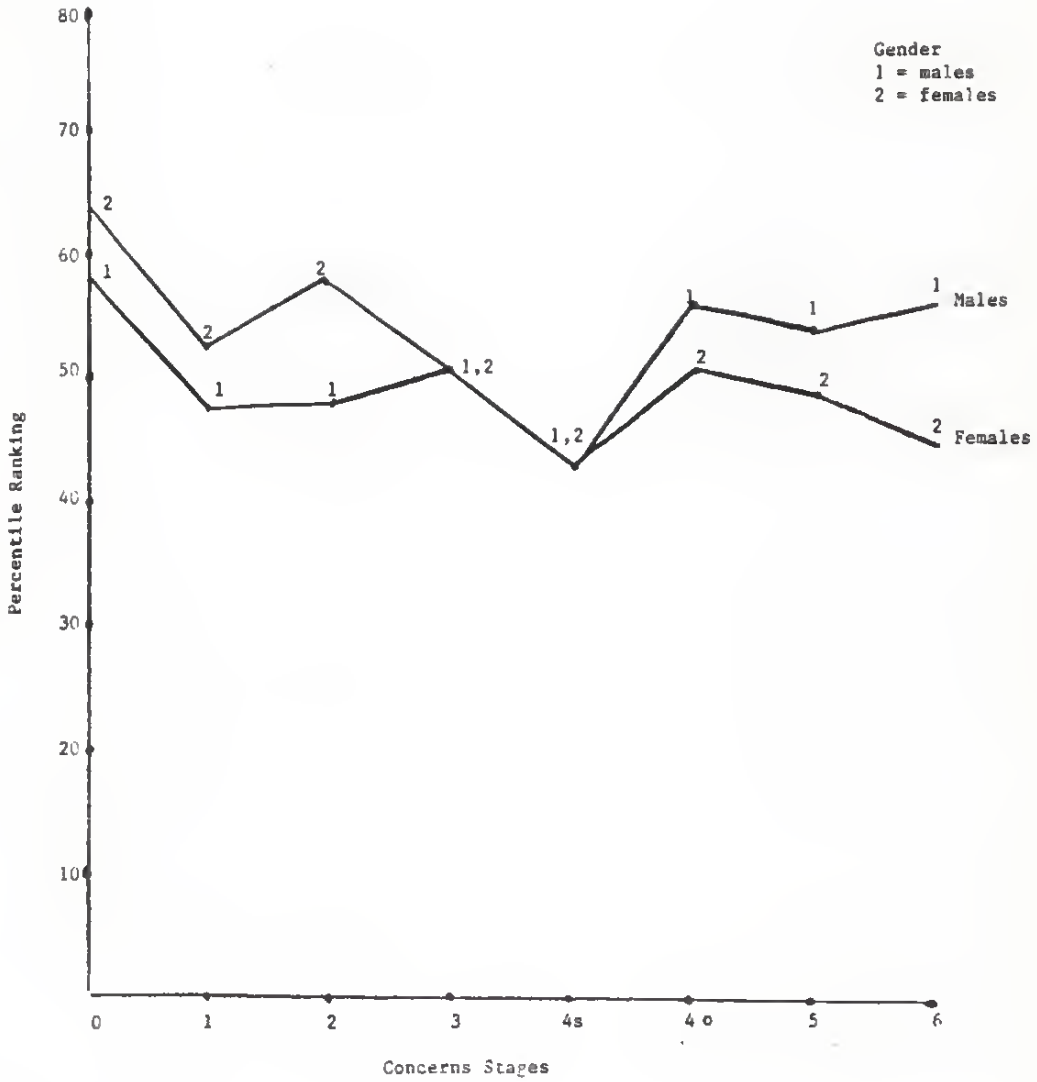

Figure 13. Concerns profile of respondents with mean percentile scores for males and females plotted against stages of concern.

The following analyses were undertaken to answer two primary questions: (1) Is age related to SoC scale scores; and (2) does the number of courses account for the apparent relationship between gender and certain SoC scores?

A comparison of the mean raw stage scores for each age group is presented in Table 48. The results of the analysis of variance are displayed in Table 49. The F probabilities indicated that the differences in raw stage score means among different age groups were significant at the .05 level for stages 3, 4s, 4o, 5 (and nearly so for stage 6). Only stages 1 and 2 were not close to showing significant differences.

Table 48

Comparison of Stage Score Means Across Six Categories of Ages of Respondents

	AGE	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
1	<20 N=49	11.29	17.61	13.71	12.90	20.00	8.65	11.35	10.06
2	20-29 N=164	9.22	17.65	15.20	15.76	22.96	11.91	15.35	10.32
3	30-39 N=103	9.21	18.25	13.91	15.12	22.21	12.34	15.03	12.73
4	40-49 N=51	8.55	16.33	14.10	15.08	22.33	13.71	14.18	11.69
5	50+ N=19	9.32	16.11	14.05	12.95	20.00	11.68	12.84	10.26

Table 49

F Probabilities and F Values for Main Effects of Age on Subjects' SoC Scores (*=Significant)

	F Probability for Each Stage F Value for Each Stage SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
p	.20	.45	.49	.0495*	.0101*	.02*	.012*	.053
F	1.50	.92	.86	2.40	3.37	2.99	3.29	2.35

The results obtained from the use of the restricted model (which tests for linearity) and the corresponding values of the correlations are displayed in Table 50. This technique probes further to determine whether the relationships between age and SoC 3, 4s, 4o, and 5 are linear ones. The correlations indicated that linearity (i.e. that the SoC scores either increase or decrease a constant amount as age increases) was not present for stages 3, 4s, and 5 ($p > .05$), but was present in stage 4o. The positive, significant correlation for stage 4o indicated that concerns in stage 4o increased as age increased. Notice however that the 50+ age group did not fit this pattern for stage 4o in the sample, but the N for that group is relatively small (19).

Table 50

Test for Linearity with Correlation and Probability Results by Six Categories of Ages

	Correlation Scores for Each Stage p Probabilities for Each Stage (*=significant)							
	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
r	-.08	-.05	-.03	-.00	-.01	.13*	.03	.08
p	.09	.26	.57	.95	.99	.02*	.61	.13

Additionally, percentiles were plotted in Figure 14 for those stages of concern that are related to age (stages 3, 4s, 4o, and 6--but only 4o has a linear relationship) against the ages themselves. Finally, percentiles are plotted in Figure 15 for the various age categories against the stages of concern for the graphic representation of the same data.

The following analysis completed the answer to question 5 as it related to gender. The "gender" analysis was then expanded by making combinations of gender and courses the independent variable. The question then became whether gender made a difference in SoC scores within each level of courses taken. Thus, if gender were related to courses (e.g. females had fewer courses), this analysis would determine whether gender was related to SoC when courses had been "controlled for". In these analyses, the coefficient associated with gender indicated the amount of difference in each SoC scale score due to gender at each level of courses. The results are reported in Table 51.

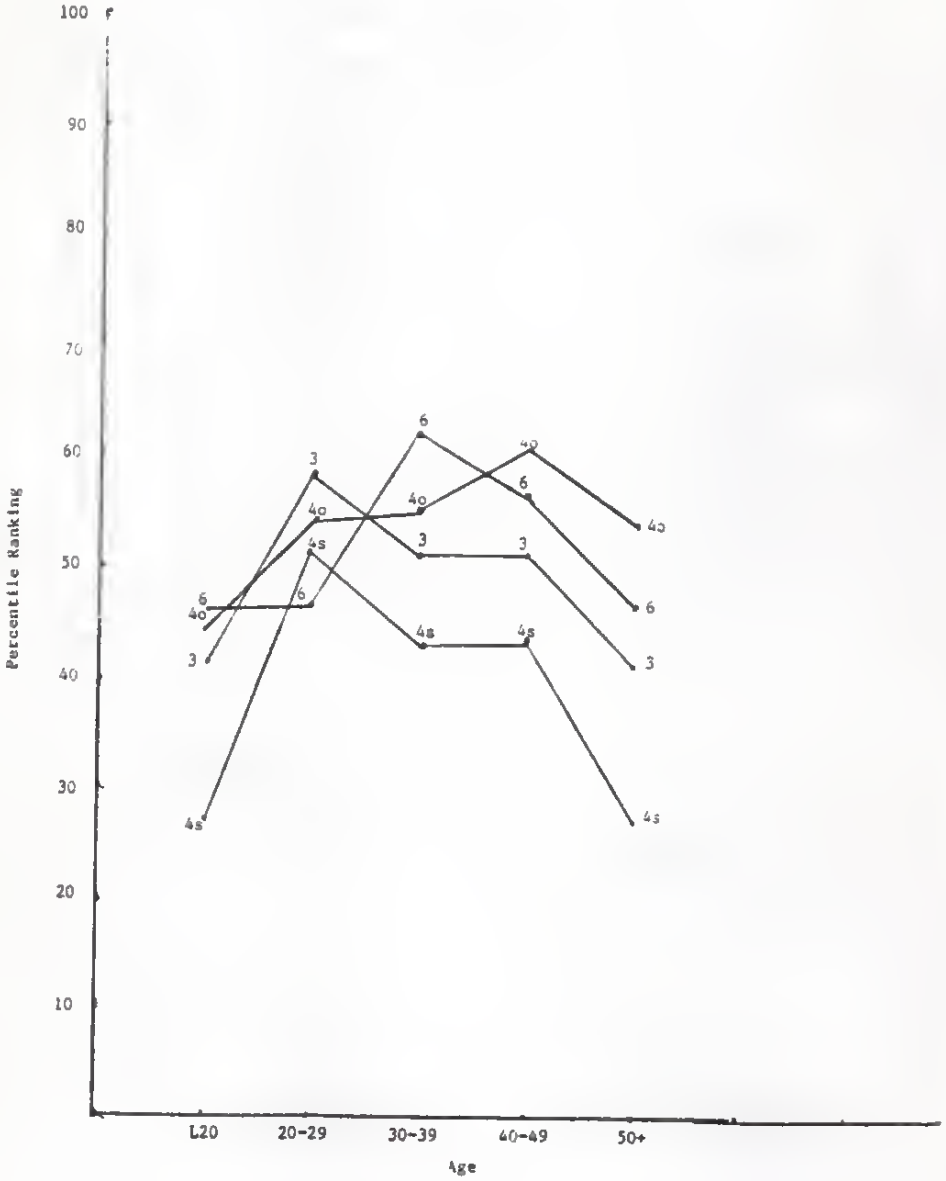

Figure 14. Stages of concern mean percentile scores plotted against ages of respondents.

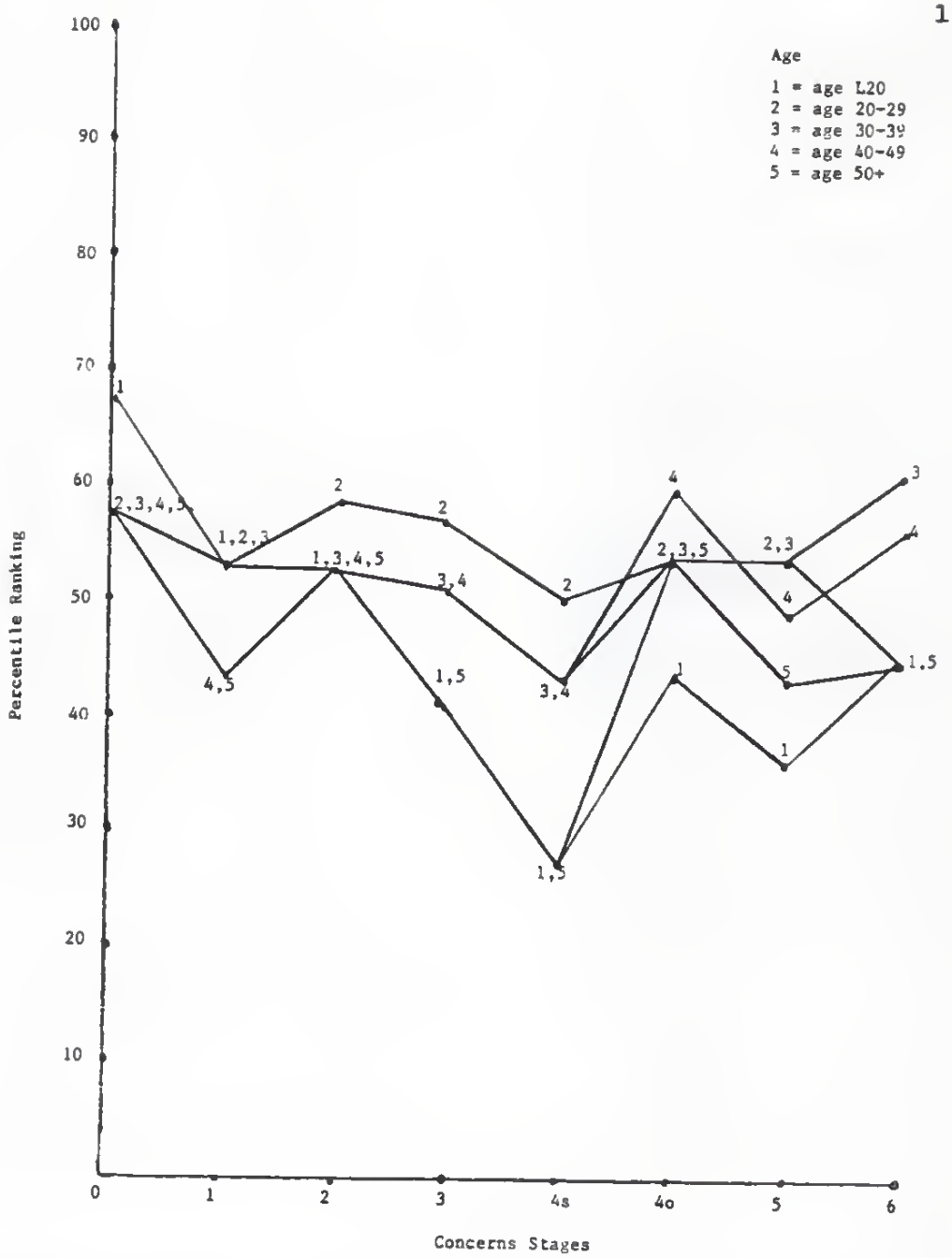

Figure 15. Concerns profiles of respondents with mean percentile scores for ages plotted against concern stages.

Table 51

ANOVA for Eight Stages of Concern by Gender and Mean SoC Scale Scores Controlling for Courses

	SoC 0	SoC 1	SoC 2	SoC 3	Soc 4s	Soc 4o	SoC 5	Soc6
Gender Coefficient	.20	1.31	1.17	.55	.79	-1.02	.59	-1.01
p<	.75	.054	.07	.39	.14	.13	.40	.15
F	.10	3.74	3.22	.73	2.16	2.29	.71	2.03

Thus, in none of these cases was gender found to be related to SoC scores. That is, all differences in SoC scores previously associated with gender were not significant when courses were taken into consideration; however, stage 1 has a p value that is very close to being significant at the .05 level. As noted earlier, females had higher scores on SoC 1 and 2 (significant) and males had higher scores on Soc 4o and 6 (significant). However, controlling for the courses variable resulted in differences no longer significant.

The linear model (i.e. linear relationship between gender and SoC scores controlling for courses) can be examined in Table 52.

Table 52

ANOVA (Linear Model) for Eight Stages of Concern by Gender and SoC Scale Scores Controlling for Courses

	SoC 0	SoC 1	SoC 2	SoC 3	SoC 4s	SoC 4o	SoC 5	SoC 6
Gender Coefficient	.24	1.37	1.16	.60	.75	-1.04	.58	- .99
p<	.69	.04*	.08	.36	.18	.12	.41	.16
F	.16	4.10	3.10	.83	1.80	2.40	.69	2.01

Gender appeared to be related significantly to SoC 1, independent of courses taken (this is where a constant difference between groups is assumed). Females seemed to have more informational concerns than males at all levels of course work. SoC 1 and courses were not related without the inclusion of gender, and then they were. Gender was related to SoC 1 with or without courses being considered.

Results Pertaining to Question 6

What effect does a major system or software change have upon a computer user's concern profile ?

The final analysis considered differences in SoC scores associated with changes faced by subjects in hardware, software, programming language, job or job assignment, or procedures. A cluster analysis was used to

get three "types" of respondents, based upon previously analyzed variables (Table 53).

Table 53

Range of Possible Values for Experience Variables

Experience Use Variables	: 0-18
Job Use Variables	: 0-9
Personal Use Variables	: 0-9
Languages Use Variables	: 0-3
Courses Taken Variables	: 0-7

Three clusters can be described by their average values on the variables. Notice in Table 54 that Cluster 1 contained the most experienced persons, Cluster 2 those of medium experience, and Cluster 3 those of low experience.

Table 54

Cluster Means by Three Levels of Experience

Cluster	Experience	Job	Personal	Language	Courses
high	14.97	5.81	6.15	3.34	6.11
medium	8.23	2.66	3.94	1.48	3.54
low	3.23	1.27	1.21	.46	1.70

Additionally, the standard score means for each cluster and each stage of concern are reported in Table 55. This permitted percentiles to be plotted for each cluster against the stages of concern. See Figure 16.

Table 55

Standard Score Means Eight Stages of Concern by Three Levels of Experience

Cluster	Stages of Concern 0	1	2	3	4s	4o	5	6
high	45.9	48.1	42.6	53.0	52.9	59.9	57.0	55.3
medium	49.0	50.0	49.2	51.9	51.4	50.6	50.6	50.6
low	51.0	50.7	53.2	47.8	48.1	46.1	47.1	47.6

With clusters (determined by level of experience) the possibility existed to ascertain whether changes in SoC scores were related to changes in level of experience.

The following question (reproduced from the questionnaire) was used to obtain the input data for the type of change being experienced.

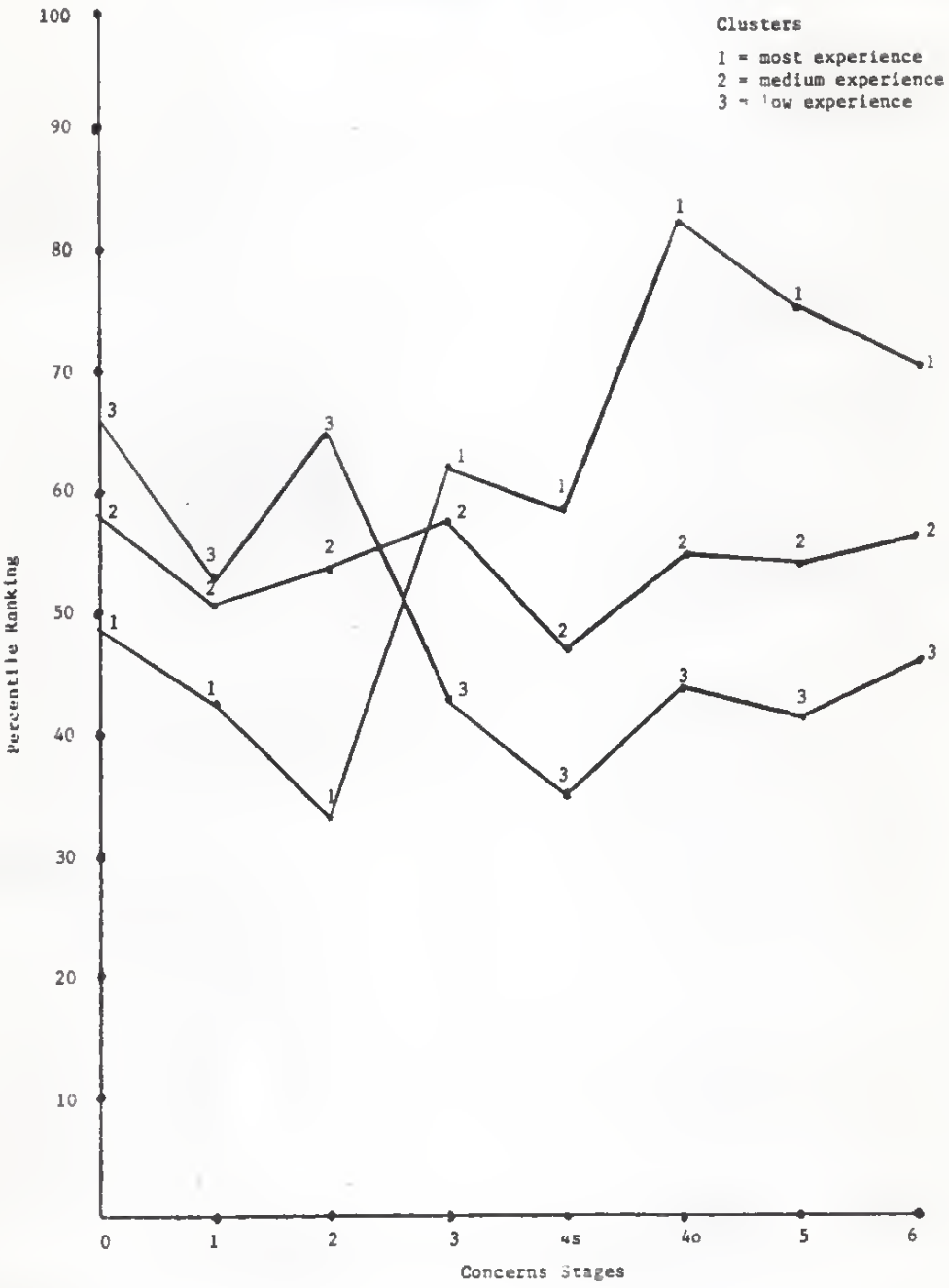

Figure 16. Concerns profile of respondents with mean percentile scores for clusters of experience plotted against concerns stages.

Question to determine whether change is being experienced				
Respond to this item only if you are currently, recently, or soon to be involved in a computing change.				
Type Change	Soon	<3 months	< 6 months	< 1year ongoing
new hardware				
new software				
new prog. lang.				
new job or assgn.				
new procedures				

The following classification was used to indicate the change status categories:

0= NONE (no change anticipated)

1= Soon (change anticipated in near future)

2= Other (change already underway)

The distribution by the type of change occurring and by level of experience is reported in Tables 56 through 60.

Table 56

Number of Respondents in Hardware Change Status by Level of Experience

			Change Status Present			
			none	soon	other	
Cluster			0	1	2	Total
high	1	1	26	10	35	72
medium	2	3	82	14	21	120
low	3	3	169	10	14	196
Total		7	277	34	70	388

Table 57

Number of Respondents in Software Change Status by Level of Experience

			Change Status Present			
			none	soon	other	
Cluster			0	1	2	Total
high	1	1	22	13	36	72
medium	2	3	76	13	28	120
low	3	3	165	11	17	196
Total		7	263	37	81	388

Table 58

Number of Respondents in Language Change Status by Level of Experience

			Change Status Present			
			none	soon	other	
Cluster			0	1	2	Total
high	1	1	39	7	25	72
medium	2	3	98	7	12	120
low	3	3	178	5	10	196
Total		7	315	19	47	388

Table 59

Number of Respondents in Job Change Status by Level of Experience

			Change Status Present			
			none	soon	other	
Cluster			0	1	2	Total
high	1	1	33	10	28	72
medium	2	3	79	20	18	120
low	3	3	170	11	12	196
Total		7	282	41	58	388

Table 60

Number of Respondents in Procedure Change Status by Level of Experience

		Change Status Present			
		none	soon	other	
Cluster		0	1	2	Total
high	1	1 31	8	32	72
medium	2	3 84	14	19	120
low	3	3 163	12	18	196
Total		7 278	34	69	388

Again the DUNCAN multiple range test was used following a significant F ratio in analysis of variance, to test the statistical significance of differences between particular group means or combinations of group means. See Table 61.

Table 61

Location of Differences in Stages of Concern Scores Across Three Levels of Change in Hardware, Software, Languages, Job, and Procedures [shown by clusters of experience]

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Change in Hardware								
High Exp.								
Med. Exp.				2-0		1-0 2-0		2-0
Low Exp.				2-0		2-1 2-0	2-0	2-1 2-0
Change in Software								
High Exp.								
Med. Exp.				2-0		2-0		
Low Exp.				2-0	2-0 2-1	2-1 2-0	2-0	2-1 1-0
Change in Language								
High Exp.				1-0		1-0	1-0	1-2
Med. Exp.				2-1			2-1	
Low Exp.				2-0		2-1	2-0	2-1
Change in Job								
High Exp.			1-2					
Med. Exp.				2-1 2-0		2-1 2-0		2-0
Low Exp.				2-1 2-0		2-1 2-0	2-1	2-0

Table 61--Continued

	Stages of Concern							
	0	1	2	3	4s	4o	5	6
Change in Procedure								
High Exp.		1-2	1-0 1-2					
Med. Exp.						1-0 2-0		1-0
Low Exp.				2-1 2-0	2-0 2-1	2-1 2-0	2-1 2-0	2-1 2-0

(0=no change anticipated, 1= change anticipated in near future, 2= change already underway)

Several important observations were made from Table 61. First note that stage 0, 1, and 2 scores were relatively independent of any type of change (hardware, software, language, job, or procedure) or time frame for that change (none, anticipated, and presently in change) being experienced. Second, the following summarizes the results according to the type of change experienced:

Hardware changes were associated with the mean SoC scores of medium and low experience persons. Those respondents experiencing change tended to score higher on

stages 3, 4o, and 6 and to a lesser extent on stage 5 (low experience only).

Software changes were associated with the mean SoC scores of medium and low experience persons. Those respondents experiencing change tended to score higher on stages 3, 4o and to a lesser extent on stages 4s and 5 (low experience only).

Language changes were associated with the mean SoC scores of respondents at all levels of experience for stages 3, 4s, 4o, 5, and 6, but in different ways. High experienced people who are anticipating change tended to score higher on stages 3, 4o, and 6; medium experienced people who are experiencing change tended to score higher on stages 3 and 5; low experienced people who are experiencing change tended to score higher on stages 3, 4o, 5, and 6.

Job changes tended to be associated with the mean SoC scores of respondents at medium and low levels of experience for stages 3, 4o, and 6. In each case those respondents experiencing change tended to score higher. However, high experienced people who were anticipating change tended to score higher on stage 2 than do those actually experiencing change.

Procedure changes tended to be associated with the mean SoC scores of respondents at high levels of experience in stages 1 and 2 where those respondents anticipating change scored higher; medium experienced people are affected in stages 4o and 6 where those respondents anticipating change tended to score higher; low experienced people actually experiencing change tended to score higher on stages 3, 4s, 4o, 5, and 6.

The number of significant differences in the mean SoC scores, by stages of concern, are reported in Table 62. Because there are 15 rows in Table 61 and there could be as many as 3 significant differences in each "cell", the maximum possible number of significant differences for any stage of concern is 45 (adding by columns).

Thus it can be seen that stages 4o, 3 and 6 generated the largest number of significant differences in mean SoC scores when changes were considered, followed by stage 5, and then stages 4s, 2, 1, and 0.

Table 62

Number of Significant Differences for Eight Stages of Concern (45 is highest possible value for each stage)

Stages of Concern	0	1	2	3	4s	4o	5	6
Number of Significant Differences	0	1	3	13	4	17	7	13

The number of significant differences in mean SoC scores is reported in Table 63 (by experience levels). Because there are 8 columns for each type of change (5 different types of change could take place) and there could be as many as 3 significant differences in each "cell", the maximum possible number of significant differences for any experience level is 120.

Low experience people generated significant changes in SoC scores over twice as often as medium experienced people, which in turn generated significant changes in SoC scores more than twice as often as high experienced people.

This concludes the presentation of the statistical findings. Conclusions and recommendations based upon these results are reported in Chapter V.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Introduction

A brief overview of this study is presented in this chapter followed by conclusions derived from the interpretation of the results of the data analysis reported in Chapter IV. In addition, a discussion regarding the implications of the results and recommendations for further research are presented. The research addressed the following questions:

1. Do identifiable "stages (factors) of concern" about the development of computing expertise exist among individuals with varying amounts of computing experience?
2. Can an instrument for assessing Stages of Concern among computer users be developed within the framework with is both reliable and valid?
3. What is the relationship of the level of computing education and experience to the sequence of concern stages?

4. What are the relationships between the intensities of various concern stages and the computing application experience levels of individuals?
5. What are the associations between age and gender with SoC scores?
6. What effect does a major system or software change have upon a computer user's concern stage and concern sequence?

Because there is a close relationship between certain questions, the discussion has been subdivided into four topics. Questions one and two constitute the first topic; questions three and four comprise the second topic; and questions five and six are the focus of the final two topics.

Study Overview

Through personal experience as an educator in the computing discipline, and supported by the results of a pilot study, the investigator began the first phase of a three phase study. The purpose was to determine if the concerns theory formulated in earlier studies of teacher education, educational innovation adoption, nursing education, and Air Force leadership training could be applied to the computing concerns of individuals with

varying amounts of computing experience. The results derived from Phase I supported the need for additional study and provided the investigator with the documentation necessary to formulate the six research questions enumerated in the introduction to this chapter. The major undertaking in the first phase was to identify the types of concerns held by a broad range of individuals about computing. An open-ended statement-of-concern form was used to collect the diverse concerns from 222 respondents. From the data, the researcher identified 156 usable statements. The statements were then Q-sorted into categories by five individuals who had varying amounts and types of computing experience and varying amounts of familiarity with the Stages of Concern model. The statements receiving a high degree of agreement as to categorical fit were included in a 78-item questionnaire which was administered during the summer of 1988 to 323 participants whose computing experience ranged from none at all to extensive. Responses from those subjects were factor analyzed using VARIMAX and Procrustes rotation to determine if factors associated with the hypothesized stages emerged. Based on the results from this preliminary questionnaire, a final, 32-item questionnaire was developed and administered to a separate sample of

participants with a broad range of computing experience in November, 1988.

There were 388 responses to this final questionnaire, and these data were again subjected to factor analysis using VARIMAX and Procrustes rotation toward a hypothesized eight-stage structure. Analysis of the factor loadings was used to determine whether identifiable stages of concern existed similar to those found in earlier concerns research. The construct validity of the instrument was measured using factor analysis results and item/stage scores, item/total scores, and interstage correlational analyses. Reliability of the 32-item questionnaire was examined by Cronbach's alpha correlation, an indication of interitem consistency, and by using test-retest correlations.

The demographic data that the sample furnished were used in analyzing data associated with the remaining research questions. Thus, questions relating to the computing experience, gender, and age of the respondents were examined. In addition, the question relating to the impact of a major change in the computing environment was addressed. This was accomplished by using analyses of variance to determine differences among mean stage score responses for each variable subgroup. Further analyses of the effects of these variables were made by converting mean

stage scores to percentile rankings followed by a comparison of concerns profiles across the identified stages.

Conclusions

Appropriateness of the Concerns Model and Reliability and Validity of the 32-Item Questionnaire

Although conclusive evidence was not found to substantiate the presence of all hypothesized eight stages, the results of the factor analyses and item stage correlations did support the presence of five and possibly six of the eight hypothesized computing concerns stages. One additional stage received a very modest amount of support. A review of the factor loadings revealed that factors most clearly substantiated were those associated with Stages 0 (conceptual), 1 (informational), and 2 (personal). Factors associated with Stages 4s (consequence - self), 5 (collaboration), and 6 (refocusing) were supported although not as completely as those factors associated with the first three stages. Stage 6 was supported except that one of the items projected for that stage loaded slightly higher as a representative of Stage 5. In the case of Stage 4s, two items that were considered originally to belong in adjoining stages loaded equally high or slightly higher on Stage 4s. In regards to Stage 5, two items projected for Stage 4o, one item projected for

Stage 6 and one item projected for Stage 3 (task management) were found interspersed among items projected to belong to Stage 5. There appears to be mixed support for the factors associated with Stage 3 as indicated by the factor loadings because two of the four items projected to be Stage 3 items loaded slightly higher on other stages. Also, a Stage 4o item was associated with Stage 3. Stage 4o items were dispersed throughout Stages 3, 4s, and 5 and did not seem to be identified as a separate component when any of the analysis techniques were used.

The lack of clarity with Stage 3, which was also found in the Barucky study of Leadership Concerns of recipients enrolled in various Air Force training programs (1984), may be the result of other competing concerns occurring simultaneously as an individual copes with Stage 3 task management concerns. As in the case of computing where individuals are having to cope with a technology that is still very young and imperfect, there always seems to be task management concerns no matter how much experience one has. Perhaps it is not surprising that this type of concern was not captured as clearly as concerns associated with other stages.

Even though the stages of concern differ conceptually there exists a high degree of correlation between responses to some of the individual items selected to represent

Stages 4o, 5, and 6. This phenomenon was also not totally unexpected since the same circumstance was evidenced in prior concerns research (Kolb, 1983; Barucky, 1984). A possible explanation for the occurrence centers on the recognition that the stages represent a sequential progression and are therefore related developmentally. Stage theories of development recognize the overlap between adjacent stages (Flavell, 1975). More mature levels of functioning build upon earlier stages thus accounting for the integration between stages of development. The simplex matrix indicating the intercorrelation of the stage scales (Table 27, p. 113) generally supports this hierarchical relationship among stages of concern of computer users.

Stage 4s items, which are associated with the consequential impact on self that the individual experiences as a result of the use of the technology, seemed to enjoy support as an independent construct while the traditional Stage 4, represented in this study by Stage 4o, was the weakest of the stages. There was not a clear pattern as to which of the adjacent stages the 4o items tended to be associated with, although Stage 5 seemed to have the strongest correlation. Yet, as will become apparent in the discussion of the research questions relating to age, gender, and type of experience, a distinction emerges among subgroups as they responded to 4o

items versus the Stage 5 items or, for that matter, any other stage items.

Therefore, although not all eight stages were clearly established as independent constructs, there was sufficient evidence to support their possible existence in all cases. This support can be found from the fact that most of the items which loaded highest on a factor were items projected to represent a single hypothesized stage. In addition, even in those cases where that was not true, those items loaded highest on a stage adjacent to the one originally proposed and which may be related developmentally to that hypothesized stage.

Relationship of Experience and Education to the Sequence of Concern Stages and the Intensities of Concern Stages

The researcher concluded from the data that the number of computer courses that an individual has taken is related to all stages of concern except Stage 1. Apparently informational concerns (Stage 1) continue regardless of how many courses have been taken. Since computing is itself evolving and at the same time proliferating into so many aspects of life, both job and personal, the need for greater information never subsides. Indeed, information gained can become obsolete so quickly that there is an enormous amount of pressure to be informed. Yet to develop a current base of knowledge in all areas of computing is no

longer a reality. The results obtained support the premise that there is a recognized need to gain increasing information no matter how much knowledge has already been obtained.

However, with the exception of Stage 1, the remainder of the results are in keeping with prior concerns research applied to other fields. As the number of courses increased Stages 0 and 2 mean scores decreased (a negative correlation) while Stages 3, 4s, 4o, 5, and 6 mean scores increased (a positive correlation). In other words, self concerns subsided (except for informational) while task and impact concerns became more evident as additional courses were taken. Further, the relationships between all Stages of concern (except Stage 1) and number of courses taken were linear as evidenced in Table 31 (page 120) and graphically in Figure 2 (page 119) which plotted mean score percentiles against number of courses taken for those stages of concern.

Experience with software also seemed to result in the generation of the same general pattern of fluctuation in the intensities of stage scores as was evidenced when the impact of courses taken was assessed. When the amount of word processing or spreadsheet experience increased, Stage 0 concerns decreased while stages 4o (consequence - others) and 5 (collaboration) concerns increased. Stage 4s and 5

concerns likewise increased as subjects gained experience with graphics or database, but Stage 2 (personal) concerns decreased. Similarly, Stage 4o concerns increased as the amount of game or "other" experience increased, while Stage 2 concerns decreased.

One explanation for the decrease in Stage 2 concerns might be related to the difference in the level of computing sophistication required in the use of graphics, database, and "other" (e.g. financial) when compared with the amount of skill required for an individual to be involved in the casual use of word processing or spreadsheet applications. An individual with substantial graphics, database or other experience may have developed the expertise necessary to allow Stage 2 concerns to actually diminish. Individuals with a lot of game experience possibly have developed a strong sense of pleasure from the use of computers and this is reflected in their lower Stage 2 concern scores.

Stage 3 (task management) concerns, 4s (consequence - self), 4o (consequence - other), 5 (collaboration), and 6 all increased as the amount of job use or personal use experience increased while Stage 0 (conceptual) and 2 (personal) concerns decreased. Similarly, as the amount of programming languages experience increased so did Stages 4s, 4o, and 5 scores, while Stages 0 and 2 decreased.

This is additional confirmation that greater experience results in greater intensities of concerns Stage scores in the higher stages and a diminishing of stage scores in the earlier stages. Stage 1 (informational) concerns still do not follow the pattern. Nonetheless, these results are what one might expect or predict if the theoretical stages of concern framework was found to be appropriate for assessing the stages of concerns of computer users.

The investigator also found that students had higher stage 2 (personal) concerns than non-students, but non-students had higher stage 4o, 5, and 6 scores. Non-professionals had higher stage 0, 1, and 2 scores than professionals, while the opposite held for stages 3, 4s, 4o, 5, and 6. Thus, professionals seemed to have higher task and impact concerns than non-professionals, while non-professionals had higher self concerns than did professionals.

As reported in Tables 44A and 44B (pages 143 and 144), mean scores for Stages 4o, 5, and 6 increased as expertise increased, while Stage 0 scores declined as expertise increased. In both cases a linear relationship existed between experience and stage score means. Stage 2 scores also declined as expertise increased except in this case the relationship was non-linear. However, a closer review of the SoC 2 column of significant pairs in both tables

reveals that if subjects with no experience were eliminated a possible linear relationship would also exist in this case.

Relationship of Gender and Age to Stages of Concern in the Development of Computing Expertise

The initial analysis yielded results which suggested that gender was related to SoC scale scores. In the cases of Stages 1, 2, 4o, and 6 there was evidence of a linear relationship. A positive correlation existed for Stages 1 and 2 indicating that females scored higher than males when informational and personal concerns were assessed. A negative correlation was found to exist for Stages 4o and 6 indicating that males had higher consequence (others) and refocusing concerns. As noted previously in Chapters I and II, there is considerable evidence in the literature to support the finding that females have higher personal concerns (anxiety or apprehension) than males (Pinto, 1986; Sproull, Zubrow, & Kiesler, 1986; Wallace, 1986). However, when an additional variable, number of courses, was "controlled for" a somewhat different pattern emerged which tended to diminish the findings of the earlier analysis. In these analyses the coefficient associated with gender indicated the amount of difference in each SoC scale score due to gender at each level of courses. As was noted in Chapter IV, in none of these cases was gender found to be

related to SoC scores--there were no significant differences when courses were taken into consideration. Stage 1 did have a p value that was very close to being significant at the .05 level. When linearity was tested gender again appeared to be related significantly to Stage 1, independently of courses taken. Apparently females have more informational needs than males no matter how many courses have been taken.

Analyses were also undertaken to ascertain if a relationship between ages of the respondents and mean SoC stage scores existed. The F probabilities indicated that the differences in raw stage score means among different age groups were significant (.05 level) for Stages 3, 4s, 4o, and 5 (and almost so for stage 6). Stages 1 and 2 were the only ones far removed from yielding significant differences. When the test for linearity was applied the correlations indicated that linearity was present only for stage 4o. That is, as age increased so did stage 4o concerns increase (an exception to the pattern was found in the 50+ age group which was discounted because of the small value of N). This would suggest that the older an individual becomes the greater the concern about the consequences that their computing expertise has on others. Intuitively one might arrive at a similar conclusion.

Relationships Between a Major System or Software Change and a Computer User's Concern Profile

Respondents were categorized as having "high", "medium", or "low" amounts of experience for the analyses undertaken to ascertain whether relationships exist between hardware, software, programming language, job or job assignment, or procedures changes and mean stages of concern scores. Various types of experience use factors (Table 53) and their respective values (based upon the range of values possible in each case) were taken into account in the determination of respondents to be included in each experience category. Three possible time frames for change were considered; no change, anticipation of change, or presently involved in change.

As might be expected, the number of significant differences in mean SoC stage scores of low experience people was more than twice that found for medium experienced people, and almost five times that of high experienced people. When hardware, software, jobs, language, and procedures were considered, low experience people who were experiencing change tended to have higher mean SoC scores for stages 3, 4o, 5, and 6 than those who were not experiencing change or those who were anticipating change. The same pattern applied to stage 4s but only when considering software and procedure changes.

When hardware was considered, medium experienced people, who were experiencing change tended to have higher mean SoC scores for stages 3, 4o, and 6 than those who were not anticipating change. Similar patterns were found for medium experienced people as follows: with respect to software, those experiencing change had higher mean SoC scores for stages 3 and 4o than those who were not anticipating change; with respect to language, those who were experiencing change had higher mean SoC scores for stages 3 and 5 than those who were anticipating change; with respect to jobs, those who were experiencing change had higher mean SoC scores for stages 3 and 4o than those who were anticipating a change; again, with respect to jobs, those who were experiencing change had higher mean SoC scores for stages 3, 4o, and 6 than those who were not anticipating change; with respect to procedures, those who were experiencing change had a higher mean SoC score for stage 4o than those who were not anticipating change; and those who were anticipating change had higher mean SoC scores for stages 4o and 6 than those who were not anticipating changes in procedures.

For high experienced people with respect to jobs, those who were anticipating a change had a higher mean SoC score for stage 2 than those who were experiencing change; with respect to procedures, those who were anticipating

change had higher mean SoC scores for stages 1 and 2 than those who were experiencing change; also, again with respect to procedures, those who were experiencing change had a higher mean SoC score for stage 2 than those who were not anticipating change. In summary, with respect to high experience respondents, the only significant differences involved stages 1 and 2, and in each of those seven significant differences, the anticipation of change tended to generate the highest SoC scores. Thus, although high experience people generated fewer significant differences than medium or low experienced people (see Table 63), they were acutely affected when change was imminent.

Discussion

The investigator has made the following observations based upon more than eight years of experience teaching computing or computing-related subjects. A very basic observation centers on the apprehension exhibited by novice computer users who are attempting to learn to use the technology effectively. The new user often has a fear of the mechanics of hardware-related tasks (such as engaging the printer) and experiences difficulties with software fundamentals (such as "booting" the system). A broad range of diverse and sometimes complex problems can frustrate and delay the student's progress. Even the

simplest applications can require a considerable amount of time to master.

Individuals generally begin to exude confidence after they have had some experience with the computer system. These feelings of confidence are often accompanied by a sense of personal achievement and a heightened sense of self satisfaction. However, frequently when the computer user finally experiences this level of mastery over the system, a change in the computing environment occurs. Indeed, computing seems to be closely linked with change. The change may involve software, hardware, procedures or tasks, or even a combination of these. The excitement and challenge of the technology may now be temporarily diminished by the concerns (of varying types and intensities) induced by change. Subjects with more computing experience often have concerns about change that center on the maintenance of their peer relationships; the degree to which the product developed will serve the client; or on learning new or better tools and techniques within the innovation. These are important considerations because attitudes regarding any innovation are crucial in the determination of how well an individual will cope in a society that must be able to embrace change in order to be competitive in the world market. According to Kanter (1983), change brought about through adoption of

innovations is fundamental to the economic well-being of corporate America.

The investigator also has come to the conclusion that concerns about computing varied based not only upon the total amount of computing experience, but also upon the "newness" of the current task. Even though highly experienced individuals may suffer some anxiety when faced with a computing change, that anxiety is not as intense nor does it last as long when compared with the anxiety suffered by less experienced individuals.

Moreover, males and females sometimes seem to approach computing problems quite differently. For example, males tend to be more likely to simply "try it out". Females, on the other hand, tend to follow documentation and proceed more cautiously. They are frequently more timid and appear more apprehensive than their male counterparts, at least until they have developed a certain level of expertise. As experience and confidence increase, they evolve into much less timorous users of the technology. Both genders may eventually learn to use the technology equally well, yet females seem to be more structured in their approach, while males seem to be more adventurous (and careless!). Thus, one rarely, if ever, finds mention of a female hacker.

The results of the research undertaken in the study tended to support, in whole or in part, many of the

preceding observations. Individuals have concerns that can be categorized as self, task, or impact. Further, the intensity of the concerns changed as one gained experience with computers. The intensities of the concerns may also be altered when a change in the computing environment occured.

The number of computing courses taken by an individual is an important variable in his or her concerns profile. The concerns profiles of females were congruent to that of males only when the courses variable was controlled for. The use of computers by females must then be encouraged and supported so they do not become less competitive as students and in their careers, in a society where sophisticated uses of the technology have become increasingly important to upward professional mobility. "The vast majority of managerial and most executive positions have high potential for using automation effectively . . . the greatest barriers to successful automation are the attitudes and misperceptions of the people occupying those positions" (Wilk, 1989, p. 44).

A departure from prior concerns research came about as the study progressed through the identification of a possible additional stage of concern, namely that of Stage 4s (consequence--self). Previously, when consequence was

considered, a client was always identifiable as the recipient of the use of the innovation (e.g. teacher/student, nurse/patient). However, when computing was considered, certain benefits accrued to the individual independent of the existence of a client. The study seemed to support the authenticity of this stage.

One final observation in the consideration of the results of the study involved the timing of the administration of both the 78-item preliminary questionnaire and the 32-item final questionnaire. In both cases the data were collected after the mid-point in the semester. By that time some of the students who were not successful in their classes had officially withdrawn (so they would not receive a failing grade). Therefore the sample consisted primarily of those students who had attained some measure of success in their coursework. The effect of this occurrence on the results can only be speculated.

Recommendations

The following recommendations are made based on the experience gained from conducting this study and the findings and conclusions reported previously.

1. Testing of the 32-item questionnaire. The instrument should be administered again to determine if the findings reported in this study can be verified by a

separate sample of computer users with varying amounts of computing experience. Many of the same research questions should be addressed.

2. Determine the effect of timing of data collection. Both the 78-item preliminary questionnaire and the 32-item final questionnaire were administered subsequent to the mid-point in the semester. Frequently, students who are not succeeding as well as they would like, withdraw from the course by that time. Since data were collected after the middle of the semester those individuals were not part of the sample. If another study or testing of the instrument were to be undertaken, it might be best to collect data earlier in the semester.

3. Determine whether refinements within each type of change would produce the same set of significant differences that the types of change specified within this study produced. Research question 6 dealt with changes in hardware, software, programming languages, job or job assignment, or procedures. An additional useful analysis would be to determine whether refinements within each type of change produce approximately the same set of significant differences SoC stage scores. For instance, a particular type of job change might generate a different set of significant differences than another. The same could be possible with respect to programming languages (the

language C might produce far greater concerns than a more widely accepted language such as BASIC) and the other types of change encountered.

4. Development of interventions to eliminate the differences in mean stage scores between males and females. Appropriate interventions could be developed to eliminate the differences in mean stage scores between males and females. Encouraging females to take additional computer courses is one approach, but there may be other ways to accomplish the desired objective.

5. Determine the impact of computing jobs on mean stage scores. The comparison of non-professionals to professionals produced significant differences in all stage scores. Further refinements within these work classifications would help pinpoint those kinds of jobs that produce the highest self, task, and impact stage score means.

Summary

The conclusions drawn from the results of the data analysis were presented along with recommendations for further research. The general purposes of the study were achieved. Concerns theory did appear to be an appropriate framework for assessing the computing concerns of individuals with varying amounts of computing experience. A reliable and valid instrument for measuring these

concerns was developed. The sequential nature of concerns stages was verified and the effect of experience, age, and gender were analyzed. In addition, the impact of a change in the computing environment was explored.

APPENDIX A
EXAMPLE CBAM PROJECT
OPEN-ENDED STATEMENT OF CONCERN

Name (Optional) _____

It is very important for continuity in processing these data that we have a unique number that you can remember. Please use:

Last 4 digits SS# _____ _____ _____ _____

The purpose of the open-ended question on the next page is to determine what people who are using or thinking about using innovations are concerned about at various times during the innovation adoption process.

Please respond in terms of your present concerns, or how you feel about your involvement or potential involvement with the innovation of TEAMING. We do not hold to any one definition of this innovation, so please think of it in terms of your own perceptions of what teaming involves. Remember to respond in terms of your present concerns about your involvement or potential involvement with TEAMING.

Thank you for taking the time to complete this task.

Adapted from Procedures for Adopting Educational Innovations/CBAM Project R&D Center for Teacher Education, The University of Texas at Austin (Hall, George, & Rutherford, 1979).

RESPONSE SHEET

WHEN YOU THINK ABOUT TEAMING, WHAT ARE YOU CONCERNED ABOUT? (Do not say what you think others are concerned about, but only what concerns you now.) Please write in complete sentences, and please be frank.

(1)

Do not write in this space

(2)

(3)

Please place a check by the statement that concerns you most.

DEMOGRAPHIC PAGE

PLEASE COMPLETE THE FOLLOWING:

(1) What percent of your job is:

teaching ___% administration ___% other (specify) ___%

(2) Female _____ Male _____

(3) In your present situation, how long have you been a member of a faculty team?

never___ 1st year___ 2nd year___ 3rd year___ 4th year___ 5th year or more ___

(4) In your use of teaming, do you consider yourself to be a:

nonuser____ novice____ intermediate____

old hand___ past user___

(5) During this school year, have you received formal training in teaming (workshops, courses)?

yes _____ no _____

(6) Are you currently in the 1st or 2nd year of use of some major innovation or program other than teaming?

yes _____ no _____

If yes, please describe briefly:

(7) Next year, what do you expect to be doing (write the appropriate number in each blank)?

1=very unlikely 2=unlikely 3=probably 4=very likely

team teaching in this school _____
team teaching in another school _____
teaching in a self-contained classroom _____
holding an administrative post _____
other (specify) _____

(8) Please check to see if you have indicated the last four digits of your social security number on the front page of this questionnaire. Thank you for your help.

APPENDIX B
COMPUTER USE
OPEN-ENDED STATEMENT OF CONCERN

The purpose of the open-ended question on the next page is to determine what people who are using or thinking about using computers are concerned about at different points in their careers.

Please respond in terms of YOUR PRESENT CONCERNS, or how you feel about your involvement or potential involvement with THE USE OF THE COMPUTER. Think about your concerns in relation to YOUR OWN current thoughts and feelings about computers. These concerns could include anything from how to turn it on to highly technical issues. Again, please think of it in terms of YOUR OWN CONCERNS, what is it about computers that is of most concern TO YOU NOW.

Thank you for taking time to complete this task.

RESPONSE SHEET

WHEN YOU THINK ABOUT USING A COMPUTER, WHAT ARE YOU CONCERNED ABOUT? (Do not say what you think others are concerned about, but only what concerns you NOW.) Please write in complete sentences, and please be frank.

(1)

(2)

(3)

You may use the other side of this page if you need more space. Please place a check by the statement that concerns you most.

DEMOGRAPHIC INFORMATION

PLEASE COMPLETE THE FOLLOWING:

1. I am (or have majored/minored) majoring/minoring in computing or information sciences or a related field:

   yes _____ no _____

2. The following applies to the number of courses/ seminars/workshops that I have taken that were oriented toward the use of computers. (Check only one response)

   none _____ one _____ two _____ three _____

   four _____ five _____ six _____ more than six _____

3. I have used the following types of computer programs: (Check ALL that apply)

   wordprocessing _____ spreadsheet _____ graphics _____

   database/file management _____ statistical _____

   games _____ other specialized programs _____ (specify)

   _____

   I have written computer programs: yes _____ no _____
   If yes, what language(s) did you use?

4. Please respond to the following which apply:

   I regularly use (or have used) a computer on the job:
   yes _____ no _____ If yes, specify the use(s):

   I am a professional in the computer field:
   yes _____ no _____ If yes, how many years have you been a computer professional? _____

   I regularly employ a computer for personal use:
   yes _____ no _____ If yes, specify the use(s);

5. In your use of computers, do you consider yourself to be a:

   nonuser____ novice____ intermediate____ old hand____

   I learned to use a computer _____ years ago.

6. Age _____ Female _____ Male _____

APPENDIX C
COMPUTER USE
REQUEST FOR PARTICIPATION

To all participants:

I am enrolled in the doctoral program in the Department of Educational Leadership at the University of Florida. For my dissertation, I am conducting a survey to find out what kinds of concerns students, computer professionals, and other users and nonusers of computers have about the use of computers. I am interested in obtaining responses to the following questionnaire from people with varying amounts of computing experience, and I would very much appreciate your participation in this project.

Your participation in the study is both voluntary and anonymous. Completion of the questionnaire will imply consent to participate in the survey. If you are willing to participate in this study, please fill out the questionnaire and return it to me in the envelope provided. Do not include your name on either the questionnaire or the envelope.

The questionnaire consists of two parts. The first part looks at concerns you have about computers, and the second part covers personal and computing experience information. The personal and experience information will be used only to categorize responses by groups and will not be used to identify individuals.

The information that you provide will assist me in including all of the relevant data for this study. Accurately identifying the various concerns of individuals that arise while working with computers is important in order to better understand the total development process. To accomplish this task I must receive input from people who are not professionals in the computer field, but who use computers in some aspect of their education, career, or personal life, as well as from computer professionals.

Thank you for your assistance in this project. Your contribution to research by participation in this study is greatly appreciated.

APPENDIX D
78-ITEM COMPUTING CONCERNS QUESTIONNAIRE

COMPUTING CONCERNS QUESTIONNAIRE

The purpose of this questionnaire is to determine what people are concerned about when they think about computers. The items in the questionnaire were developed from typical responses of nonusers of computers and people with varying amounts of computing experience. Some of the statements will closely reflect your own thoughts about computers. Others may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

This statement is very true of me at this time.	0	1	2	3	4	5	6	7
This statement is somewhat true of me now.	0	1	2	3	4	5	6	7
This statement is not at all true of me now.	0	1	2	3	4	5	6	7
This statement seems irrelevant to me.	0	1	2	3	4	5	6	7

Please respond to the items in terms of your present concerns or how you feel about your involvement with the use of computers. Do not respond as you think others would feel; please think of your responses in terms of your present concerns about computers.

Your participation in responding to this questionnaire is both voluntary and anonymous. Please do not write your name on the questionnaire.

Thank you for taking the time to complete this task. Also, please use the last page to express any additional concerns you have about computers or this questionnaire.

Developed by Jean B. Martin

	0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7
1. I would like to know if it is worthwhile to have a computer for personal use.	0	1	2	3	4	5	6	7
2. I would like to help others in facilitating their use of computers.	0	1	2	3	4	5	6	7
3. I am concerned about the ease of use of computing tasks that I complete.	0	1	2	3	4	5	6	7
4. I would like to revise my current methods of providing information and/or instruction about the use of computers.	0	1	2	3	4	5	6	7
5. I think the world is too saturated with computers; people have become numbers rather than individuals.	0	1	2	3	4	5	6	7
6. I am concerned about the lack of easy-to-use equipment and/ or programs.	0	1	2	3	4	5	6	7
7. I wonder what the differences are among types of computers.	0	1	2	3	4	5	6	7
8. I am concerned about the quality and accuracy of the computing tasks that I complete.	0	1	2	3	4	5	6	7
9. I would like to know what other people who use computers are doing.	0	1	2	3	4	5	6	7
10. Learning how to use computers provides me with many benefits.	0	1	2	3	4	5	6	7
11. Computers have a way of making me feel incompetent.	0	1	2	3	4	5	6	7
12. I am concerned about remembering what I have learned about computing.	0	1	2	3	4	5	6	7
13. I think that children are too dependent upon computers.	0	1	2	3	4	5	6	7

0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7

14. I would like to incorporate new methods for diminishing the apprehension associated with the use of computers.	0	1	2	3	4	5	6	7
15. I am concerned about the lack of physical exercise associated with the use of computers.	0	1	2	3	4	5	6	7
16. I would like to know more about the many uses and applications of computers.	0	1	2	3	4	5	6	7
17. I would like to focus greater attention on the importance of considering the environment in which an application will be used rather than on the technology alone.	0	1	2	3	4	5	6	7
18. I see a potential conflict between the demands of computing and overloading people.	0	1	2	3	4	5	6	7
19. My life is easier because of what I can do with computers.	0	1	2	3	4	5	6	7
20. I want to revise my present methods of providing information about computing in order to include more practical examples.	0	1	2	3	4	5	6	7
21. I would like to develop a working relationship with people who have computing expertise.	0	1	2	3	4	5	6	7
22. I fear that I might expose my ignorance about a computing topic that should be familiar to me.	0	1	2	3	4	5	6	7
23. I know that my level of expertise with computers may determine my prospects in my employment and/or when I seek employment.	0	1	2	3	4	5	6	7

	0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7		
24.	I am concerned about finding the time needed for my computing work.	0	1	2	3	4	5	6	7	
25.	I am concerned about the excessive dependence on computers and the deemphasis on human skills.	0	1	2	3	4	5	6	7	
26.	I am concerned about my ability to do the computing tasks required of me.	0	1	2	3	4	5	6	7	
27.	My goal is to provide assistance with computer related work that is beneficial to the recipient.	0	1	2	3	4	5	6	7	
28.	I think that playing computer games may limit a child's creativity and imagination.	0	1	2	3	4	5	6	7	
29.	It is very rewarding to me when my computer work is successful.	0	1	2	3	4	5	6	7	
30.	I am concerned about computers taking people's jobs.	0	1	2	3	4	5	6	7	
31.	The reliable operation of printers and other devices is of real concern to me.	0	1	2	3	4	5	6	7	
32.	I would like to excite others about their involvement with computers.	0	1	2	3	4	5	6	7	
33.	I like to provide data/ information/output in the best form possible for the benefit of anyone who sees or uses it.	0	1	2	3	4	5	6	7	
34.	I would like to know what the use of computers will require in the immediate future.	0	1	2	3	4	5	6	7	
35.	I have a fear of pressing the wrong key and messing up what I am working on.	0	1	2	3	4	5	6	7	

0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7

36.	I want to be able to get help when I need it.	0	1	2	3	4	5	6	7
37.	I am concerned about following the proper sequence of steps when using a computer.	0	1	2	3	4	5	6	7
38.	I am concerned about the limited amount of exchange of information about computers.	0	1	2	3	4	5	6	7
39.	I would like to incorporate much more creativity in my computer related tasks.	0	1	2	3	4	5	6	7
40.	I am concerned about computers causing eye problems.	0	1	2	3	4	5	6	7
41.	I am concerned about incorporating changes that I can make to increase consideration of people in their use of computers.	0	1	2	3	4	5	6	7
42.	I would like to know more about how a computer operates.	0	1	2	3	4	5	6	7
43.	I am concerned about the effect I have on others in their use of computers.	0	1	2	3	4	5	6	7
44.	I am concerned about problems having to do with disks or other file storage equipment.	0	1	2	3	4	5	6	7
45.	I want to try new methods of increasing accountability in the use of computers.	0	1	2	3	4	5	6	7
46.	I feel apprehensive when introduced to a new program, computer application, or equipment.	0	1	2	3	4	5	6	7
47.	I wonder how others view my computing ability.	0	1	2	3	4	5	6	7
48.	I want to know more about computers.	0	1	2	3	4	5	6	7

0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7

49.	I am concerned that machines have become more important than people.	0	1	2	3	4	5	6	7
50.	I am concerned with the impact of computers on the future of civilization.	0	1	2	3	4	5	6	7
51.	I would like to initiate changes that would make the use of computers more rewarding.	0	1	2	3	4	5	6	7
52.	I would like to work with others in the accomplishment of computer tasks.	0	1	2	3	4	5	6	7
53.	I am concerned about criticism of my computer related work.	0	1	2	3	4	5	6	7
54.	I would like to take part in more frequent discussions about computing issues.	0	1	2	3	4	5	6	7
55.	It is important to me that my computer work is efficient.	0	1	2	3	4	5	6	7
56.	The tasks of saving and retrieving my computer work are of real concern to me.	0	1	2	3	4	5	6	7
57.	I wonder how people actually made the machine and got all the flaws out of it.	0	1	2	3	4	5	6	7
58.	I would like to share information about what I am doing with others.	0	1	2	3	4	5	6	7
59.	I am concerned about finding out what tasks I can use a computer to do.	0	1	2	3	4	5	6	7
60.	I wonder if I can learn how to use a computer.	0	1	2	3	4	5	6	7
61.	I am concerned about developing new methods for incorporating fundamental computing principles in my work.	0	1	2	3	4	5	6	7

0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7

62.	I like to apply what I have learned about computing to practical problems.	0	1	2	3	4	5	6	7
63.	I am concerned that what I have learned about computers will soon be obsolete.	0	1	2	3	4	5	6	7
64.	I am concerned about how well the computer application I have developed performs when it is used.	0	1	2	3	4	5	6	7
65.	I would like to know what it is like to program a computer.	0	1	2	3	4	5	6	7
66.	I would like to supplement my present methods of working with a computer with other techniques.	0	1	2	3	4	5	6	7
67.	I think it is important that my computer application I have developed performs when it is used.	0	1	2	3	4	5	6	7
68.	I want support materials to be helpful when a problem is encountered.	0	1	2	3	4	5	6	7
69.	I want to communicate more effectively with others so that they understand the computing task to be completed.	0	1	2	3	4	5	6	7
70.	I wish that I could learn to accept computers more readily.	0	1	2	3	4	5	6	7
71.	Communication and/or problem-solving relative to computer work takes too much time.	0	1	2	3	4	5	6	7
72.	I am concerned about knowing what to do next when using a computer.	0	1	2	3	4	5	6	7
73.	I see a potential for conflict between the need for computing resources and the availability of funds.	0	1	2	3	4	5	6	7

	0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7	
74.	I am interested in knowing how computers can process data so rapidly and efficiently.		0	1	2	3	4	5	6 7
75.	I would like to determine the best way to enhance my computing skills in order to be more effective.		0	1	2	3	4	5	6 7
76.	I would like to have greater interaction with other users of computers to work on common problems.		0	1	2	3	4	5	6 7
77.	I am concerned about the loss of privacy resulting from the use of computers.		0	1	2	3	4	5	6 7
78.	I would like to coordinate more closely with others whose computer work will be associated with mine.		0	1	2	3	4	5	6 7

Most of these items are designed to identify the types of computing experience you have had. Thank you for your cooperation.

1. Gender: Female _____ Male _____

2. Age: under 20 _____ 20-29 _____ 30-39 _____
   40-49 _____ 50-59 _____ 60 or over _____

3. How many courses, seminars, and/or workshops have you taken that were oriented toward the use of computers? (CHECK ONLY ONE RESPONSE.)

   None _____ One _____ Two _____ Three _____
   Four _____ Five _____ Six _____ More than six _____

4. Indicate the amount of experience that you have had with each type program in the space provided.

	None	Less than 6 months	6-18 months	More than 18 months
word processor	____	____	____	____
spread sheet	____	____	____	____
graphics	____	____	____	____
database	____	____	____	____
games	____	____	____	____
other:(specify)				
_____	____	____	____	____

5. Please indicate with a check in the spaces provided if you have written computer programs in any of the following languages.

   Pascal _____ BASIC _____ COBOL _____ C _____
   Fortran _____ PL/I _____ Other: _____

6. Do you regularly use a computer on the job?
   Yes _____ No _____
   If yes, specify the use(s) (e.g., spread sheet, word processing, statistical). _____
   _____

7. What specifically is your current position(s) (e.g., manager, secretary, programmer, student, nurse, mechanic). _____

8. Do you regularly employ a computer for personal use?
   Yes _____ No _____
   If yes, specify the use(s) (e.g., word processing, tax preparation, games). _____

9. In your use of computers, do you consider yourself to be a(n):
nonuser____ novice____ intermediate____ old hand____

10. How long have you been using a computer?

Never ____ 0-3 months ____ 4-6 months ____
6-12 months ____ 1-2 years ____ 2-5 years ____
5-8 years ____ More than 8 years ____

11. Are you currently, recently, or soon to be involved in a computing change (e.g., learning a new program, using new hardware, learning a new technique)?
Yes _____ No _____
If yes, specify the change. _____
How long have you been involved in this change?
_____

78-Item Preliminary Questionnaire Statements
Items Listed by Hypothesized Stage

Stage 0: Contextual Concerns

5. I think that the world is too saturated with computers; people have become numbers rather than individuals.

13. I think that children are too dependent upon computers.

15. I am concerned about the lack of physical exercise associated with the use of computers.

25. I am concerned with the excessive dependence on computers and the deemphasis of human skills.

28. I think that playing computer games may limit a child's creativity and imagination.

30. I am concerned about computers taking people's jobs.

40. I am concerned about computers causing eye problems.

49. I am concerned that machines have become more important than people.

50. I am concerned about the impact of computers on the future of civilization.

77. I am concerned about the loss of privacy resulting from the use of computers.

Stage 1: Informational Concerns

1. I would like to know if it is worthwhile to have a computer for personal use.

7. I wonder what the differences are among types of computers.

16. I would like to know more about the many uses and applications of computers.

34. I would like to know what the use of computers will require in the immediate future.

42. I would like to know more about how a computer operates.

48. I want to know more about computers.

57. I wonder how people actually made the machine and got all the flaws out of it.

59. I am concerned about finding out what tasks I can use a computer to do.

65. I would like to know what it is like to program a computer.

74. I am interested in knowing how computers can process data so rapidly and efficiently.

Stage 2: Personal Concerns

11. Computers have a way of making me feel incompetent.

12. I am concerned about remembering what I have learned about computing.

22. I fear that I might expose my ignorance about a computing topic that should be familiar to me.

26. I am concerned about my ability to do the computing tasks required of me.

35. I have a fear of pressing the wrong key and messing up what I am working on.

46. I feel apprehensive when introduced to a new program, computer application, or equipment.

47. I wonder how others view my computing ability.

53. I am concerned about criticism of my computer related work.

60. I wonder if I can learn how to use a computer.

63. I am concerned that what I have learned about computers will soon be obsolete.

70. I wish that I could learn to accept computers more readily.

72. I am concerned about knowing what to do next when using a computer.

Stage 3: Management Concerns

6. I am concerned about the lack of easy-to-use equipment and/or programs.

18. I see a potential conflict between the demands of computing and overloading people.

24. I am concerned about finding the time needed for my computing work.

31. The reliable operation of printers and other devices is of real concern to me.

36. I want to be able to get help when I need it.

37. I am concerned about following the proper sequence of steps when using a computer.

44. I am concerned about problems having to do with disks or other file storage equipment.

56. The tasks of saving and retrieving my computer work is of real concern to me.

68. I want support materials to be helpful when a problem is encountered.

71. Communication and/or problem-solving relative to computer work takes too much time.

73. I see a potential for conflict between the need for computing resources and the availability of funds.

Stage 4S): Self Consequence Concerns

8. I am concerned about the quality and accuracy of the computing tasks that I complete.

10. Learning how to use computers provides me with many benefits.

19. My life is easier because of what I can do with computers.

23. I know that my level of expertise with computers may determine my prospects in my employment and/or when I seek employment.

29. It is very rewarding to me when my computer work is successful.

55. It is important to me that my computer work is efficient.

62. I like to apply what I have learned about computing to practical problems.

75. I would like to determine the best way to enhance my computing skills in order to be more effective.

Stage 4(0): Others Consequence Concerns

3. I am concerned about the ease of use of the computing tasks that I complete.

27. My goal is to provide assistance with computer related work that is beneficial to the recipient.

32. I would like to excite others about their involvement with computers.

33. I like to provide data/information/output in the best form possible for the benefit of anyone who sees or uses it.

43. I am concerned about the effect I have on others in their use of computers.

64. I am concerned about how well the computer application I have developed performs when it is used.

67. I think that it is important that my computer work be done so that others can read and understand it.

Stage 5: Collaboration Concerns

2. I would like to help others in facilitating the use of computers.

9. I would like to know what other people who use computers are doing.

21. I would like to develop a working relationship with people who have computing expertise.

38. I am concerned about the limited amount of exchange of information about computers.

52. I would like to work with others in the accomplishment of computer tasks.

54. I would like to take part in more frequent discussions about computing issues.

58. I would like to share information about what I am doing with others.

69. I want to communicate more effectively with others so that they fully understand me and the computing task to be accomplished.

76. I would like to have greater interaction with other users of computers to work on common problems.

78. I would like to coordinate more closely with others whose computer work is associated with mine.

Stage 6: Refocusing Concerns

4. I would like to revise my current methods of providing information and/or instruction about the use of computers.

14. I would like to incorporate new methods for diminishing the apprehension associated with the use of computers.

17. I would like to focus greater attention on the importance of considering the environment in which an application will be used rather than on the technology alone.

20. I want to revise my present methods of providing information about computing in order to include more practical examples.

39. I would like to incorporate more creativity in my computer related tasks.

41. I am concerned about incorporating changes that I can make to increase consideration of people in their use of computers.

45. I want to try new methods of increasing accountability in the use of computers.

51. I would like to initiate changes that would make the use of computers more rewarding.

61. I am concerned about developing new methods for incorporating fundamental principles in my work.

66. I would like to supplement my present methods of working with a computer with other techniques.

APPENDIX E
32-ITEM COMPUTING CONCERNS QUESTIONNAIRE

COMPUTING CONCERNS QUESTIONNAIRE

The purpose of this questionnaire is to determine what people are concerned about when they think about computers. The items in the questionnaire were developed from statements of concerns about computing made by people with varying amounts of computing experience. Some of the statements will closely reflect your own thoughts about computers. Others may be irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

This statement is very true of me at this time.	0	1	2	3	4	5	6	7
This statement is somewhat true of me now.	0	1	2	3	4	5	6	7
This statement is not at all true of me now.	0	1	2	3	4	5	6	7
This statement seems irrelevant to me.	0	1	2	3	4	5	6	7

Please respond to the items in terms of your present concerns or how you feel about your involvement with the use of computers. Do not respond as you think others would feel; please think of your responses in terms of your present concerns about computers.

Your participation in responding to this questionnaire is both voluntary and anonymous. Please do not write your name on the questionnaire.

Thank you for taking the time to complete this task.

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0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now	4	5	6 Very true of me now	7

1. I am concerned about the quality and accuracy of the computing tasks that I complete.	0	1	2	3	4	5	6	7
2. I would like to revise my current methods of providing information and/or instruction about the use of computers.	0	1	2	3	4	5	6	7
3. I feel apprehensive when introduced to a new program, computer application, or equipment.	0	1	2	3	4	5	6	7
4. I think the world is too saturated with computers; people have become numbers rather than individuals.	0	1	2	3	4	5	6	7
5. I am concerned about the effect I have on others in their use of computers.	0	1	2	3	4	5	6	7
6. I would like to know more about how a computer operates.	0	1	2	3	4	5	6	7
7. I would like to have greater interaction with other users of computers to work on common problems.	0	1	2	3	4	5	6	7
8. I have a fear of pressing the wrong key and messing up what I am working on.	0	1	2	3	4	5	6	7
9. My goal is to provide assistance with computer related work that is beneficial to the recipient.	0	1	2	3	4	5	6	7
10. I would like to know more about the many uses and applications of computers.	0	1	2	3	4	5	6	7
11. It is very rewarding to me when my work is successful.	0	1	2	3	4	5	6	7

0 Irrelevant | 1 Not true of me now | 2 3 Somewhat true of me now | 4 | 5 6 Very true of me now | 7

12.	The reliable operation of printers and other devices is of real concern to me.	0	1	2	3	4	5	6	7
13.	I am concerned about my ability to do the computing tasks required of me.	0	1	2	3	4	5	6	7
14.	I am concerned about the excessive dependence on computers and the deemphasis on human skills.	0	1	2	3	4	5	6	7
15.	It is important to me that my computer work is efficient.	0	1	2	3	4	5	6	7
16.	I am concerned about problems having to do with disks or other file storage equipment.	0	1	2	3	4	5	6	7
17.	I want to revise my present methods of providing information about computing in order to include more practical examples.	0	1	2	3	4	5	6	7
18.	I would like to excite others about their involvement with computers.	0	1	2	3	4	5	6	7
19.	I would like to work with others in the accomplishment of computer tasks.	0	1	2	3	4	5	6	7
20.	I am interested in knowing how computers can process data so rapidly and efficiently.	0	1	2	3	4	5	6	7
21.	I am concerned that machines have become more important than people.	0	1	2	3	4	5	6	7
22.	The tasks of saving and retrieving my computer work are of real concern to me.	0	1	2	3	4	5	6	7

0 Irrelevant	1 Not true of me now	2	3 Somewhat true of me now		4	5	6 Very true of me now		7

23.	Learning how to use computers provides me with many benefits.	0	1	2	3	4	5	6	7
24.	I would like to take part in more frequent discussions about computing issues.	0	1	2	3	4	5	6	7
25.	I am concerned about incorporating changes that I can make to increase consideration of people in their use of computers.	0	1	2	3	4	5	6	7
26.	I am concerned about what to do next when using a computer.	0	1	2	3	4	5	6	7
27.	I would like to coordinate more closely with others whose computer work will be associated with mine.	0	1	2	3	4	5	6	7
28.	I see a potential for conflict between the need for computing resources and the availability of funds.	0	1	2	3	4	5	6	7
29.	I would like to initiate changes that would make the use of computers more rewarding.	0	1	2	3	4	5	6	7
30.	I am concerned about finding out what tasks I can use a computer to do.	0	1	2	3	4	5	6	7
31.	I am concerned about how well the computer application I have developed performs when it is used.	0	1	2	3	4	5	6	7
32.	I think that playing computer games may limit a child's creativity and imagination.	0	1	2	3	4	5	6	7

Most of these items are designed to identify the types of computing experience you have had. Thank you for your cooperation.

1. Gender: Female _____ Male _____

2. Age: under 20 _____ 20-29 _____ 30-39 _____
   40-49 _____ 50-59 _____ 60 or over _____

3. How many courses, seminars, and/or workshops have you taken that were oriented toward the use of computers? (CHECK ONLY ONE RESPONSE.)

   None _____ One _____ Two _____ Three _____
   Four _____ Five _____ Six _____ More than six _____

4. Indicate the amount of experience that you have had with each type program in the space provided.

	None	Less than 6 months	6-18 months	More than 18 months
word processor	____	____	____	____
spread sheet	____	____	____	____
graphics	____	____	____	____
database	____	____	____	____
games	____	____	____	____
other special purpose	____	____	____	____

5. Please indicate in the spaces provided if you have employed a computer program on the job or for personal use to accomplish the following tasks.

Task	On the job	Personal use
writing	_____	_____
calculating/spreadsheet	_____	_____
graphics	_____	_____
file management/data base	_____	_____
telecommunication	_____	_____
data entry	_____	_____
programming	_____	_____
games/entertainment	_____	_____
special purpose/tax, finance, etc.	_____	_____

6. How long have you been using a computer?

   Never _____ 0-3 months _____ more than 3 months _____
   more than 6 months _____ more than 1 year _____
   more than 3 years _____ more than 5 years _____

7. In your use of computers, do you consider yourself to be a(n):
nonuser____ novice____ intermediate____ old hand____

8. Please indicate with a check in the spaces provided if you have written computer programs in any of the following languages.

BASIC _____ COBOL/Fortran _____ Pascal/C _____
dBase/Rbase _____ Prolog/Lisp _____
Unix/CICS/Assembler _____

9. Are you currently a student? Yes _____ No _____

10. Are you a computer professional? Yes _____ No _____

11. What specifically is your current position(s) (e.g., programmer, educator, mechanic, nurse, accountant).
_____

12. Respond to the item only if you are currently, recently, or soon to be involved in a computing change.

Type Change	Soon	Involved less than 3 months	Involved less than 6 months	Involved less than 1 year	Ongoing
hardware	____	____	____	____	____
software	____	____	____	____	____
programming language	____	____	____	____	____
new job or job assignment	____	____	____	____	____
new procedures	____	____	____	____	____

32-Item Final Questionnaire Statements
Items Listed by Hypothesized Stage

Stage 0: Contextual Concerns

4. I think that the world is too saturated with computers; people have become numbers rather than individuals.

14. I am concerned with the excessive dependence on computers and the deemphasis of human skills.

21. I am concerned that machines have become more important than people.

32. I think that playing computer games may limit a child's creativity and imagination.

Stage 1: Informational Concerns

6. I would like to know more about how a computer operates.

10. I would like to know more about the many uses and applications of computers.

20. I am interested in knowing how computers can process data so rapidly and efficiently.

30. I am concerned about finding out what tasks I can use a computer to do.

Stage 2: Personal Concerns

3. I feel apprehensive when introduced to a new program, computer application, or equipment.

8. I have a fear of pressing the wrong key and messing up what I am working on.

13. I am concerned about my ability to do the computing tasks required of me.

26. I am concerned about knowing what to do next when using a computer.

Stage 3: Management Concerns

12. The reliable operation of printers and other devices is of real concern to me.

16. I am concerned about problems having to do with disks or other file storage equipment.

22. The tasks of saving and retrieving my computer work is of real concern to me.

28. I see a potential conflict between the need for computing resources and the availability of funds.

Stage 4s: Consequent (self) Concerns

1. I am concerned about the quality and accuracy of the computing tasks that I complete.

11. It is very rewarding to me when my computer work is successful.

15. It is important to me that my computer work is efficient.

23. Learning how to use computers provides me with many benefits.

Stage 4o: Consequence (others) Concerns

5. I am concerned about the effect I have on others in their use of computers.

9. My goal is to provide assistance with computer related work that is beneficial to the recipient.

18. I would like to excite others about their involvement with computers.

31. I am concerned about how well the computer application I have developed performs when it is used.

Stage 5: Collaboration Concerns

7. I would like to have greater interaction with other users of computers to work on common problems.

19. I would like to work with others in the accomplishment of computer tasks.

24. I would like to take part in more frequent discussions about computing issues.

27. I would like to coordinate more closely with others whose computer work is associated with mine.

Stage 6: Refocusing Concerns

2. I would like to revise my current methods of providing information and/or instruction about the use of computers.

17. I want to revise my present methods of providing information about computing in order to include more practical examples.

25. I am concerned about incorporating changes that I can make to increase consideration of people in their use of computers.

29. I would like to initiate changes that would make the use of computers more rewarding.

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Jean Buddington Martin was born in Washington, D.C., on October 23, 1943, the daughter of Russell and Ruby Buddington. After graduating in 1961 from Anacostia High School, Washington, D.C., she began her family and worked in various positions prior to entering the University of Maryland in College Park, Maryland. She received the degree of Bachelor of Science with a major in education from the University of Maryland in 1972. Following graduation, she taught at the elementary, junior high, and secondary school levels, and was employed in the court systems in the Washington area in secretarial and administrative positions. In 1980 she received the degree of Master of Arts with a major in management and supervision from Central Michigan University. From 1980 through 1984 she was employed as Assistant Professor of business and computing at Charles County Community College in La Plata, Maryland. In 1984 she also received the degree of Master of Science in computing science education from the University of Evansville, Evansville, Indiana. From 1984 through 1988, she was employed as Assistant

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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